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MASSACHUSETTS

AGRICULTURAL JOURNAL.

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REMARKS ON SOILING.

[Communicated by the Hon. Josiah Quincy.]

The practice of "soiling cattle," as it is called, or keeping them, all the year round, in their stables, with only a daily and short liberty of a yard, having been a frequent subject of the attention, and an object of a proffered premium, by the board of Trustees of the Massachusetts Society for promoting Agriculture, I shall, in conformity with their request, communicate my own practice and experience, on that mode of managing stock.

Previously, however, to stating any observations, upon the results of my own experience, I think it may be useful to abstract and digest into a regular form, some of the principal facts and reasonings of transatlantic farmers. These may tend to attract the attention of our practical husbandmen more forcibly to the subject, and enable those, whose farms and capital are in a condition that authorizes the adopting of this mode, to do it with more facility and success.

There are six distinct advantages, which those, who advocate soiling, propose to themselves by the practice, and on which they establish the preference of this mode to the common one of pasturing cattle during the summer.

1st. The saving of land.

2d. The saving of fencing.

3d. The economizing of food.

4th. The better condition and greater comfort of the cattle.

5th. The greater product of milk.

6th. The attainment of manure.

The only offset to all these advantages is the labour of raising and cutting the food, and feeding and taking care of the stock.

1st. *The saving of land.* In relation to this fact, there can be no question. All European writers assert it. They differ only as to the degree of saving which results. Some assert that it is as *one* to *three*. Others, as *one* to *seven*. Others assert the saving to be yet greater. That is, *one acre kept for soiling will go as far as three or seven kept for pasture, in the support of stock.* It is not important to analyze this point farther. For every practical purpose, the evidence is sufficient, to satisfy every mind, that a very great saving of land results from this practice, and that on farms, *where the whole soil is capable of being ploughed*, the economy of soiling is great; and on all such farms may profitably be adopted, provided that the expenses, incident to the mode, do not counterbalance these advantages.

It may be, however, useful to observe that the reason of the diversity of statement, in relation to the degree of saving, among European writers, results from the different ways, in which the land, used for soiling, is cultivated for the purpose of raising food. Some satisfy themselves with enriching the former pasture and cutting the grass it produces, for the soiling use. Others plough up the pasture, raise cabbages or other succulent food, on which they support their stock. Now it is plain the result of a comparison of saving of land made between an acre of enriched pasture, and an acre, appropriated to the latter of these modes of husbandry, must be very different.

In either case, the economy is sufficiently great, and, if nothing else be an offset for the advantage, this must be decisive.

2*d*. *Saving of fencing*. Here also is a great and decided economy. It includes not only the saving of the material used for fencing; the labour of making the fence; and of keeping it in repair; but also of the land occupied by the fences; and of all the headlands, which are necessarily left on each side the fence; and which are usually an apology for slovenliness and a refuge for vermin. I have seen no precise estimate of this economy. Nor does it seem to be practicable, to be made, upon any principle, applicable to farms in general. It will be obviously greater, or less, according to the previous condition of the fences, and the ordinary necessity of erecting such as are usually deemed requisite on each particular farm. Here also the greatness of the economy is, everywhere, so obvious as to render any particular calculations unimportant. The general effect of soiling cattle is, *to render all interior fences absolutely useless;* excepting those, which surround the buildings, and lead from these to the highway. A farm thus relieved from interior fences, not only enjoys all the exemptions from great actual and great annual expenditures, but also there are other facilities, in its management, resulting from this absence of interior fences, which are obvious and considerable. There is no waste land. The whole may be divided into cultivation, with precise reference to the state of soil. When the plough runs, the length of the furrow is determined only by the judgment of the proprietor. It presents to the eye a scene of cultivation; neat, orderly and beautiful.

3*d*. *The economy of food*. There are six ways by which beasts destroy the article destined for their food. 1. By eating. 2. By walking. 3. By dunging. 4. By staling. 5. By lying down. 6. By breathing on it. Of these six, the first only is useful. All the others are wasteful.

By pasturing, the five last modes are exercised without any check, or compensation. By keeping in the house, they may be all prevented totally by great care; and almost totally, by very general and common attention.

It is on the saving, resulting from this prevention of waste that much of the economy of this mode of keeping beasts depends. In pastures, whatever is trod upon, or is affected by their dung, or their urine, is lain upon, or even long breathed upon, is lost. And this waste is always in proportion to the richness and the productive power of the pasture; for just in that proportion is the quantity of food injured by all the five modes of destruction above stated. Whereas the same being cut and delivered to them sparingly, in point of time, but sufficiently in point of quantity, will every particle of it be consumed. Besides, it is found by experience, that, in this mode of feeding, beasts will eat many products of the earth, in the stall, which they will absolutely reject in the pasture.

4th. The better condition and greater comfort of the cattle.

The condition of cattle will always depend chiefly upon the quantity and the quality of the food and regularity of their supply. In all these respects, feeding in the stall has the advantage of pasturing, because in stall feeding, all are under the guidance of intelligence and discretion; and nothing is left to accident, whereas, in pasturing, the beasts are left to their own care. When the pastures are good, and there is a great surplus of food upon them, the difference is not, in this respect, great; but as soon as the pastures become "pinched" as it is called, by drowth, the difference is always perceptible. Farmers, who pasture their cattle, seldom, if ever, provide a supply of succulent food, to be in readiness in case of any accidental deficiency of pasture. The consequence is that, on the pasturing system, the summer condition of cattle always depends wholly on the state of the pastures. Now as every farmer, where he is able, does, and ought to stock his pastures up to their full pasture power, it follows, that even a small drought will affect the condition of the animal something; and a severe one, very sensibly; a fact, of which every

man may convince himself by observing cattle, at pasture, in dry seasons. Now one great benefit, resulting from stall feeding, is that it makes the condition of cattle, in as great a degree as possible independent of variations of the season ; and although an absolute independence is impossible, yet it is always much greater in stall feeding than it can be in any mode of pasturing.

The want of sufficient exercise, which is inseparable from this mode of feeding in stalls, is a popular, and when not tested by fact, is deemed an unanswerable objection. Yet all those who have made the experiment and whose opinions I have seen expressed upon the subject, are unanimous in declaring that no ill effect results from this circumstance. One writer asserts that he has kept a large herd for several years, in this way, and during the whole time, "he never had an animal essentially sick, had never one die, and had never one miscarry."

It is to be observed that stall feeding of cattle, does not imply keeping cattle in stalls, or in the house *the whole* time. It only intends, always feeding them there, and keeping them there the chief of the time. On the contrary, it is an essential part of the system, to let them loose in yards, well shaded either artificially, or by trees, at least two hours in the forenoon and as many in the afternoon. Here they lay themselves at their ease, in the best ruminating attitudes, or move round taking some exercise in that act, or in rubbing themselves against posts provided for the purpose. If any person will observe the slowness, with which cattle usually walk in their pastures, that while in feeding they do little more than stand ; and when full, that they almost invariably lie down, he will hardly believe that the difference between the exercise thus attained and that which they get by having four hours in the day exclusively devoted to that object, can scarcely materially affect their health. When to this is added the consideration, that when fed in the stall, they are wholly protected from eating any

noxious vegetables; from drinking bad water; from all injury, from being worried by dogs, or one another; that they are kept through the heat of the day, in the cool shades; under cover; protected from flies; it cannot be a question but that this mode is far more conducive to the health of the animal than pasturing possibly can be. Experience is also decisive upon the subject. If the condition of the animal be, as is here shown, better, it follows that this state must be more comfortable; for the one is dependant on the other.

5th. Greater product of milk. Although it is generally stated that this is the case, yet I do not recollect having met with any precise comparison upon the subject. The general apprehension among farmers, seems to be, that although the condition of the animal may be better, yet that the tendency of the food to milk is not so great as when they are permitted to range in pastures. The truth, however, upon this point can easily be explained, and in a manner perfectly conformable to my own experience. During the flush of feed, that is, for perhaps the first month after cattle are turned to pasture, there is little difference, so far as respects the milk product, between pasturing and stall feeding. At that time there is generally a great supply of food, the cattle are eager after it. They have great opportunity to select. They feed quietly, and take only the most nutritious and palatable. After this month, if the stall feeder will, this equality will gradually cease; and in his favour. The pasture food almost always grows more or less scarce, according to the particular character of the season. Whereas by taking care to provide a regular succession of succulent crops, he who feeds his beasts in stalls may keep the milk product unaffected by the state of the season, to the end of the autumn.

6th. The attainment of manures. This is a great and characteristic benefit, resulting from soiling; or stall feeding of cattle through the year. In pasturing, the sum-

mer manure is almost wholly lost. It falls upon rocks, among bushes, in watercourses, on the sides of hills. It is evaporated by the sun. It is washed away by the rain. Insects destroy a part. The residuum, a dry hard cake, lies sometimes a year upon the ground; often impeding vegetation, and never enriching the earth, in any thing like the proportion it would do, if it had been deposited under cover and kept free from the action of the sun, in appropriate and covered receptacles, to be carted out annually in the proper season, and ploughed at once under the surface.

The gain by this saving of the summer manure of beasts, although stated by European writers, yet it is generally loosely done, and often in measures of quantity, or capacity, not easily reducible to those, which prevail in our country. It is, however, unequivocally very great and important, and well worthy the solicitude of every farmer. As the great object of every farmer ought to be, to increase his quantity of manures, there can be no mode preferable to the one here suggested. For suitable receptacles, or recipients being provided, every thing of the nature of excrementitious matter is preserved and deposited in the soil, at the leisure and at the discretion of the farmer.

It was the conviction, resulting from the preceding facts and statements, which led me to adopt, two or three years since, the idea of putting my farm into this mode of management. The particular situation of it, seemed to point it out as precisely suited to such a mode of conduct. It is a level plain, constituted of alluvion upon clay, occasionally intermixed with lighter quality of soil. It had no fences but post and rails, so that by adopting this mode, it might be wholly relieved from interior fences, the expense of which had always been a heavy item in my farm accounts. For the three years past, I have been, in this practice. During the two former years with some occasional deviations. During the last, regularly, and systematically, without any deviation. The result has been all that I anticipated, in

every respect. Indeed it has been so satisfactory, that I think no considerations would induce me to adopt a different mode in the management of my stock.

The result of my experience has been perfectly conformable to the statements made by European writers.

My stock has been uniformly healthy ; in a condition generally superior to my neighbours' ; all of whom pastured their cattle. In point of milk, during the flush of feed in June, the product was not inferior to any, according to the number of my cows, with which I had an opportunity to compare. In July and August, in my vicinity the drowth was severe, and the milch cows in my neighbourhood fell off in their milk, nearly, and some, quite, a half. Mine were kept during the whole season, without any sensible diminution, which could be attributed to the want of food, or its quality. The cows throve and showed no marks of discontent. None were materially sick. I lost none.

With respect to stock, the practice upon my farm had been from almost time immemorial to keep from ten to fifteen head of cattle. For the support of these, *about fifty acres of land* were appropriated during the summer months. Besides which they were permitted to range in the autumn over the mowing. The result was, that in good seasons, the stock throve and were kept well. When the seasons were dry,they fared badly. When the drowth was severe, they were shut up and fed upon corn stalks or hay. This was the usual course. And the practice and the result is at this day very similar, in all my vicinity.

My practice, and the result of the past year were the following :

My stock, consisting at an average of twenty cows, were kept in their stalls through the whole year. The practice was to feed them about six times in the day, and to permit them to range in a yard about eighty feet square, two hours in the forenoon and two in the afternoon. They were kept

well littered and well curried, while they were out of the stable, the attendant took that opportunity to clean the stalls, and to supply fresh litter. During winter, they were fed, as is usual, with salt and fresh hay and vegetables.—From June to November, inclusive, may be considered, strictly speaking, the soiling season; by which is understood, that, in which they are fed with green food in the house. As this is the critical period, I shall be minute in the account of my preparations and proceedings.

In the autumn preceding I had caused rye to be sown upon an inverted sward, very thick, on about three acres. Early in April I prepared and sowed, in manner as shall be stated afterwards, about three acres and one quarter of land with Indian corn in drills. I also sowed about three acres of oats and buckwheat, broadcast, at the rate of three bushels to the acre, about the latter end of the month. The whole quantity of land I thus prepared to be used in soiling, in aid of my grass, did but little exceed nine acres. Of these, that which I sowed with rye, turned out so poorly, that I never soiled from it more than five days, so that in fact the land thus prepared did, in efficiency, but little exceed six acres.

About the first of June, cattle in general were this season turned out to pasture. On the 30th of May, my farmer began to cut the sides of the road leading to my house from the highway and orchard. He continued to soil from this and from grass growing in my orchard until the seventh. On this day he abandoned cutting the grass for soiling, and began to cut from the winter rye. This was found too tough, and it was quitted and my farmer returned to soiling upon grass. Having cut over all the refuse of my grass, by the 24th of June, he then went into the poorest of my mowing land, and afterwards into my clover. From this he continued to soil, until the 6th of July. By this time, he had gone over not much short of three acres of mowing land. On the 6th of July, he began to soil

from my oats. He continued to soil from these until the 21st of July. On the 21st of July, he began to soil on Indian corn, on which he continued until the 26th, when he began to cut about two acres of late and light barley. On this he continued until the 30th of July, when he re-commenced soiling on corn fodder, and continued upon it until the 31st day of August. On this day began to cut over the road sides, which had been first cut early in June. This was continued only to the 2nd of September, when he began to cut the second crop of Indian corn, growing upon the three and one fourth acres of Indian corn, which had now shot up in great luxuriance, from the roots of that, which had been cut over between the 21st and 26th of July. On this soiling, continued until the 8th of September.

On the 9th and 10th, he soiled upon about a fourth of an acre of millet and buckwheat. On the 11th, soiled on a second crop of clover. From the 12th to the 15th, inclusive, on corn stalks of about an acre of sweet corn, and on the 16th on a patch of millet and oats. This was continued to the 20th, when he began on two acres of Indian corn sown in drills, on the first of August, on land from which a crop of peas had been previously taken. Soiling was continued on this corn, until the 3d of October. From this time until the 15th of October, the soiling was wholly from second crop grass taken from various parts of my mowing land.

From the 15th of October, to about the 20th of November, they were kept wholly upon carrot and turnip tops arising from the topping of about twelve acres of both; being allowed always one foddering of salt hay. This finished the summer feeding. From this time they are kept wholly upon salt and English hay. The result then of this experiment, so far as relates to land, is the following:

The twenty head consumed the product of

2½ acres, roadsides and orchard.

3 do. mowing land.

3¼ do. Indian corn, cut as fodder.

8¾ Carried over.

8¼ Brought over.
2 do. late and light barley.
3 do. oats.
2 do. late sown Indian corn after a pea crop.
¼ do. Buckwheat.
1 do. millet, buckwheat and oats.

---

17 Acres.

This is the whole land which was cut over for soiling; with the exception of the after feed on the mowing land and the tops of carrots and turnips. In comparing this result with the former practice of my farm, I apprehend the following statement to be just.

I offset the keeping from the 11th of September to the 20th of November, against the old manner of letting the cattle run at large during the autumn months, on the mowing land, to its great injury, by poaching and close feeding.—If this should not be deemed sufficient, I then make no estimate of the difference between keeping fifteen head of cattle, the old stock, and twenty head of cattle, my present stock. After these allowances and offsetts, which no man can doubt are sufficiently liberal, then I state, that my experiment has resulted in relation to land, in this, that I have kept the *same amount of stock, by soiling on seventeen acres of land, which had always previously required fifty acres.* The result is, in my opinion, even in this respect greater than what is here stated. This, however, is sufficient to exhibit the greatness of the economy of this mode, so far as relates to land.

With respect to saving of fencing, the previous condition of my farm was this. I had at the lowest estimate five miles of interior fence, equal to sixteen hundred rods, which at one dollar the rod was equal, in original cost, to sixteen hundred dollars. And annually, for repairs and refitting, cost sixty dollars. *I have now not one rod of interior fence.* Of course this saving is great, distinct, and undeniable.

In relation to manures, the effect of soiling is not less apparent and unquestionable. The exact amount of summer product I have not attempted to ascertain, but I am satisfied that, every thing considered, it is not less than one buck load per month per head, or on twenty head of cattle, one hundred and twenty load for the six soiling months. In this estimate, I take into consideration the advantage resulting from the urine saved, by means of loam, sand, or some imbibing recipient, prepared to absorb it.

It remains to show that the cost of raising the food, cutting it, and distributing it to the cattle, is compensated by these savings. Upon this point, my own experience has satisfied me that the value of the manure alone, is an ample compensation for all this expence. Leaving the saving of land, of food, and of fencing stuff, as well as the better condition of the cattle, as a clear gain from the system.—As an evidence of this, I state my expences for labour in conducting the soiling process.

During the month of June, I hired a man to do every thing appertaining to the soiling process, that is, cutting the food, delivering it, taking care of the cattle in the day time, for fifteen dollars the month, he finding himself. In this arrangement, it was estimated, that I availed myself of half his labour. At the end of the month, I had the manure measured, and I found that the manure collected in my receptacle, which was a cellar, under the barn, and not including that which had been made during the four hours each day, in the yard, amounted to fifteen load. A quantity of manure, which I could not have placed on my farm, for thirty dollars ; and which I could have sold there, for twenty dollars, upon the condition it should be carried away. It cost me as above stated, fifteen dollars, in the labour of the attendant.

During the remaining five months, I added another man, because I found that a great economy in vegetable food, would result from cutting it into pieces by a cutting knife, and mixing with it about one third of cut salt hay, or straw.

This was done, and I kept an accurate account of all the labour of cutting the food, in the field, bringing it into the barn, cutting it up there, cutting salt hay or straw, to mix with it, mixing this food, and delivering it to the cattle, and found that it amounted to one hundred and forty-eight days' labour. This estimated at a dollar the day, is one hundred and forty eight dollars, to which adding fifteen dollars paid for labour, in the month of June, the whole expense was one hundred and sixty three dollars.

The manure at the end of the soiling season, certainly equalled one hundred and twenty loads, and could not have been bought, and brought there, for three hundred dollars. Let it be estimated at only two hundred dollars in value. No man can question, I think, the correctness of my assertion, that the value of the manure obtained, is a clear compensation for this amount of labour; and this including all the expense of labour, connected with soiling.

It remains to be shown, in *what* manner the whole process ought to be conducted, by any one, who may originally attempt it, and also *how far* it is applicable to the farming condition of New England, and what species of farmers would find their account in attempting it.

(To be continued in our next.)

OF SALT AS A MANURE.

[In England, considerable attention has been attracted of late, to the use of salt as a manure. The following extracts from a work, recently published in London, entitled "A Letter to the Farmers and Graziers of Great-Britain on the advantages of using Salt, in the various branches of agriculture and in feeding all kinds of farming stock, by Samuel Parkes," will present to the farmers of Massachusetts, the leading facts and considerations connected with the topic of salt as a manure.]

"In some parts of Great-Britain, particularly in the neighbourhood of the Salt Works, the value of Common Salt, as a manure, is well known and acknowledged; and it has lately been given in evidence before the select committee of the House of Commons, by a gentleman of the highest credit, that the farmers in Cornwall are so convinced of the value of Salt as a manure, that whenever the waste Salt that has been employed in curing fish is on sale, there is a violent contention among the occupiers of the land who shall obtain the largest share. The same gentleman informed the committee, that where wheat or barley has followed turnips, on land which had been salted, the ensuing crop has invariably escaped the mildew, although that disease had affected all the corn upon the lands immediately adjoining, on which Salt had not been used.

"There is also a practice in Cornwall of manuring the lands with sea-sand for the sake of the Salt that it contains; and so very efficacious is this found to be, that a writer, ninety years ago, computed the money laid out in that and the adjoining county for sea-sand to amount to thirty-two thousand pounds per annum; and so much has this practice increased of late years, that Dr. Paris considers "the expense of land carriage for sand used as a manure in *Cornwall alone* as now amounting at least to thirty thousand pounds annually.

"The efficacy of Salt in destroying noxious weeds, grubs, worms, flies, and insects, is well known in many districts, and those who are incredulous may very easily satisfy themselves by direct experiment. For instance, if a few common earth worms be taken out of the ground, and sprinkled with a little Salt, they will be seen to writhe for a few minutes, and then expire. Thus Salt does, as it were, perform two operations at once, for, by destroying the worms and the weeds, while the land lies fallow, it prepares the ground most effectually for the reception of the corn or the plants, before it can possibly take any effect upon the crop itself. And

besides this peculiar advantage, the extreme luxuriance and verdure which common Salt gives to *grass* lands, when properly applied, would be so satisfactory to such farmers who would make use of it, and so convincing to all the neighbouring agriculturists of every description, that if only one or two gentlemen in each district were to employ it in a few instances, I am certain this mode of top-dressing would very soon engage the attention of every person in the empire, who had even but a garden to manage and cultivate.

"I think it necessary to remark, that where Salt is used as a top-dressing for grass-land, the quantity employed ought to be much less than is commonly used for ground, that is to be afterwards ploughed for a crop of grain. Six bushels, or three hundred and thirty-six pounds of Rock Salt, ground *very fine*, and regularly sown upon the grass, would be a proper quantity for an acre of pasture-land; whereas sixteen or twenty bushels may be used upon fallows for cleaning the ground preparatory to the putting in the grain. For meadow-land, two or three bushels of crushed Rock Salt may be carefully sown upon each acre, immediately after the hay is got in, with great advantage, especially in hot and dry summers.

"From the evidence which has already been collected upon this subject, it is obvious that a great portion of the land in this kingdom might, by the proper use of Salt, be made to produce nearly double the amount of the present crops of grass as well as corn. How greatly this would serve the manufacturing, and indeed all other interests of the country, I need not attempt to explain to you. Moreover, by forcing the land with a sufficient portion of Salt, our crops would be brought to maturity much sooner than they now are, a matter of considerable importance in the northern parts of this island, where much of the corn is frequently spoiled by the autumnal rains before it can be sufficiently dried by the sun and wind to stack with safety. And in the hay harvest, should the farmer be induced,

from the uncertainty of the weather, to carry his hay too soon, a small quantity of Salt sprinkled upon each layer of the rick will prevent the hay from becoming mow-burned, as it is called; and when hay which has been thus treated is presented to horses and cattle, it will be preferred by them to that which has been put together in a more favourable season, and not treated with Salt.

"The late Dr. Darwin, in treating on Salt as a manure, remarks, that "as it is a stimulus which excites the vegetable absorbent vessels into greater action than usual, it may, in a certain quantity, increase their growth, by enabling them to take up more nourishment in a given time, and perform their circulations and secretions with greater energy."

"The *cleanliness* of Rock Salt as a manure is likewise another considerable advantage. In many cases this circumstance will be found to be very important, particularly in the grazing districts. It has repeatedly been observed, that if land be manured with dung *after* the hay has been carried off, the neat cattle will refuse to eat the eddish which grows upon such land. On the contrary, if a field be dressed with about two bushels of fine Salt per acre instead of dung, soon after the hay is cut, this inconvenience and loss will be avoided, and a large crop of after-grass will be obtained, possessing such peculiar sweetness, that all kinds of cattle, as well as horses, will eat it with the utmost avidity.

"The farmers, in some districts, are accustomed to steep their seed-corn in lime-water, and doubtless the practice is often useful; but I am decidedly of opinion that a strong brine, made by the solution of Rock Salt in water, will be infinitely more efficacious. Crops of wheat are often reduced one half in value by a disease to which this kind of grain is very liable, called the *smut* or *rust;* but when the seed has been properly prepared with Salt, this misfortune can never happen. It has also been proved by some public-spirited individuals, who have made the necessary experiments, that

the scab is never found upon potatoes which have grown upon land that has had a proper dressing of Common Salt.

"In many parts of Flanders, but more particularly at Lisle, it is the practice to preserve the urine of those cattle that eat Common Salt with their food. This is preserved in appropriate reservoirs, and when the farmers apply it to a certain description of land, which experience has taught them to select, the effect, even without any other manure, is not only advantageous, but it is truly astonishing."

Extracts from old writers of credit on the employment of Common Salt in Agriculture.

Gervase Markham, a learned writer in the reigns of James the 1st and Charles the 1st, who was equally noted for his skill in many foreign languages, and for his knowledge of the various branches of agriculture, published a great variety of treatises on the management of land, and closed his agricultural labours by the publication of a work entitled "*Markham's Farewell to Husbandry*," in which the following passages occur. "If you be neer unto any part of the sea-coast, thence fetch great store of the salt sand, and with it cover your ground which hath beene formerly plowed and hackt, allowing unto every acre of ground threescore or fourscore full bushels of sand, which is a very good and competent proportion; and this sand thus laid shall be very well spread and mixed among the other broken earth. And herein is to be noted that not any other sand but the Salt is good or available for this purpose, because it is the brine and saltnesse of the same which breedeth this fertility and fruitfulnesse in the earth, choaking the growth of all weeds, and giving strength, vigor, and comfort, to all kind of grain or pulse, or any fruit of better nature." Page 5.

"Now methinks I hear it objected, what if the ground do lye so farre within the land, that there is no salt-sand

within many score miles of it, how then shall I make good my barren earth? To this I answer, that albeit this salt-sea-sand be of infinite good and necessary use, inriching grounds wonderfully much; but if your ground lye much within land, and farre from the sea, then to every acre of land you shall take two bushels of very dry bay-salt, and in such manner as you sow your wheat you shall sow this salt upon the ground; then immediately after the sowing of the salt you shall sow your wheat, which wheat would be thus prepared before you sow it. The day before you are to sow your grain, you shall take bay-salt and water, and mixing them together, make a brine so strong that it will bear an egge; then put the wheat you are to sow into that brine, and let it steep therein till the next day; then drain it from the brine and so sow it; and no doubt but you shall find a marveilous great increase thereby. Neither is the thing itself without good and strong probability of much increase, and strength for the bettering of all manner of arable grounds; for there is nothing which killeth weeds, quicks, and other offences of the ground, so much as saltness." Page 12.

In the chapter respecting the treatment of land over-run with weeds, he directs such land to be covered with a certain black plant growing on the sea-shore, which is to be plowed in, and the ground harrowed; it is then to be sown with pigeons' and pullens' dung mixed together, allowing to every acre two or three bushels thereof, and he adds, "but in case you can neither get Salt, sea-sand, nor sea-weeds, then you shall by no means omit the steeping of your seed, neither shall you fail before you sow your seed, to mixe with your pidgeons' and pullens' dung a full equal part of bay-salt well dried and broke, and so sown with the dung upon the land, and then the seed after it." Page 17.

In chapter V. entitled "of the ordering of all barren clays that are over-run with ling or heath," after giving directions how to make and dress the land, he adds, "And if the ground have been sanded (with salt sea-sand) you may

sow your seed-wheat simply of itself, without any doubt of the plentifull increase thereof; but if it have not been sanded, then you shall not only steep your seed in brine, but also you shall mixe your seed with bay-salt, and so sow it into the ground." Page 27.

In the chapter which treats of the method of recovering such land as had been rendered sterile by the overflow of sea-water, Mr. Markham writes thus:

"In all my former relations, touching the bettering of ground, I do apply, as one of my chiefest ingredients, salt-sand, salt-weeds, salt-water, salt-brine, ashes, and many other things of salt nature, as indeed all the manures and marles whatsoever must either have a salt quality in them, or they cannot produce fruitfulnesse; so that it might be argued, if Salt be the occasion of fruitfulnesse and increase, then there cannot be much hurt done by these overflowes of the salt-water, that it should rather adde a fattening and enriching to the ground, than any way to impoverish it. But experience shews us the contrary; and that there is nothing more noisome and pestilent to the earth than the superabundance and too great excess of saltnesse, &c." Page 50.

"In the chapter on enriching of barren grounds for the growth of hemp and flax, he directs first to plough it, "then with the salt sea-sand, you shall sand it very plentifully, but if that be not to be gotten, and you be very well assured of the natural richness of the earth, you shall then sand it with the best red sand you can find near unto you, and upon every acre of ground you thus sand with fresh sand, you shall sow three bushels of bay-salt, and then plough up again the earth, sand and salt together, which should be done about the latter end of the yeare, as after Michaelmas, and so let the ground rest till seed-time, at which time you shall bring sea-weeds to your hemp-land, and cover it all over with the same, and then you shall plough it again, burying the weeds within the earth. As for the weeding of this ground, you

shall not respect it at all, for *it will put up no weed.*" Pages 67 and 69.

In the chapter on vermin, Mr. Markham says. "The next great devourers of grain are pismires or ants, which although it be but a little creature, yet it is so laboursome, that the grain which they carry away or destroy, amounteth to a great quantity. If you manure your corn lands with ashes or salt sand, you shall be well assured it will never breed pismires." Page 75.

"The great Lord Bacon, who flourished early in the seventeenth century, having noticed the advantages which the farmers of Cornwall, Devon, and other maritime counties, derived from the free use of sea-sand, which upon those coasts chiefly consists of broken shells impregnated with salt-water, declares that the best manure next to marle is sea-sand, which no doubt, (says his Lordship) obtaineth a special virtue by the salt-water, and concludes by affirming that salt is the first rudiment of life."—*Nat. Hist. Cent.* 6. *Exp.* 596.

In the Philosophical Transactions, is a memoir by the Archbishop of Dublin on the manuring of lands in the counties of Londonderry and Donnegall, in Ireland, with sand and shells from the sea-shore, from which I extract the following passages. Treating of boggy land, he says: —"The turf is nothing but the product of vegetables, which rotting, there remains only the earthy parts; now shells being chiefly salt, the salt incorporates with the sulphur of the plants, and renders them fit for the vegetation of new plants, which further appears from this, viz.—that those shells which have been under the salt-water, are much better than such as lie dry on the strands. Some thousands of acres have been improved by these shells, and what formerly was not worth a groat per acre is now worth four shillings. Some years ago they made lime of the shells, and manured their lands with it, but a poor man, who, from laziness or poverty, had not provided to make lime, threw the shells unburnt on

his land, and his crop proved as good as his neighbours, and the second and third crop better; and all took the hint, and have used them so ever since. Where shells are not to be procured, sea-wrack or sea-sand supply the want."—*Phil. Trans. No.* 314.

Soon after the formation of the Royal Society, Dr. Bury delivered a memoir, containing an account of the manuring of land in Devonshire with sea-sand, which is much to our purpose. "Salt," says he, "quickens dead land, and is used in the south-west part of that county, which would otherwise be the barrenest, but is now the richest part thereof. The inhabitants go as far as the sea will permit them at lowest ebb, take the sand in bags, and carry it on horseback fourteen miles into the country, and spread it on the land, thereby improving it both for corn and grass. Crude Salt alone, if strewed upon the ground, does not improve but corrode it."

Extracts from more modern writers on the use of Salt in Agriculture.

"I am well assured from a Scotch gentleman, that they have long used Salt in that part of Great-Britain, always sowing ten or twelve bushels by hand of their coarse Salt on an acre of young green wheat, sometime in November, December, January, or February, it being, from the several accounts which I have had of it, very effectual in the *killing of tender weeds* amongst corn, yet at the same time *cherishing the corn;* and though it does not add altogether to the bulk or height of the straw, yet it does much to the goodness and plumpness of the grain. And whoever has been curious in their remarks abroad, will find that it is the usual practice of the Milanese to sow Salt on their pastures, as I have been informed by one who has sold great quantities for that purpose; as also by a merchant of Liverpool, who is well acquainted with that trade, who affirms that the finest crops they have of hemp and flax amongst the Dant-

zickers and others, who raise those commodities in those countries, are from lands on which salt is strewed." *The Practical Husbandman*, 8vo. London, 1733, vol. i. p. 48.

"Salt certainly sweetens the grass much; and it may on all such occasions be mixed with a proper quantity of dung, which is more sulphureous than Salt, and will make grass shoot away much faster than any other manure. Lime in its own nature makes grass *sour*, but when mixed with Salt, that acidity will be taken away." *Practical Husbandman*, vol. i. page 57.

"As to the proportion of Salt to be used on land, it ought to be according to the nature of it; cold, wet, clayey land requiring more, and loose soft sand though it be poor requiring less. Again, the proportion of Salt ought to be either more or less, according to the crops of grass or grain you would improve. For cold, wet, and spewy land, ten loads of dung, six of earth, and eight bushels of Salt, per acre.

For lean, hungry, sandy land, fourteen loads of pond earth, six loads of dung, and six bushels of Salt per acre when employed for corn and grazing.

For meadow land, fourteen or fifteen loads of dung, five bushels of Salt, and four of pond earth, the quantity of each to be altered according to the quality of the ground." *Practical Husbandman*, London, 1738, page 59.

"On watering meadows with a solution of salt, we are directed to make a large pit about twenty or thirty feet square, and five or six feet deep, more or less, as there will be occasion, in the method tan or salt pits are made, and put therein ten or twelve bushels of salt, and as much of lime, soot, or any other ingredient of that kind, and, having a pump near at hand, or some conduit or spring of water, fill the pit up by degrees, at first to three or four feet high, letting the ingredients dissolve in the water, by being there twenty-four hours at least, stirring them sometimes about, and after that, by dipping in of the finger it will be found whether the water is salt enough (as near as you can to the

strength of sea-water) : if it is not sufficient, then may be added a reasonable quantity more of the above mentioned materials ; but if it be too salt, then more water may be poured in till it is just right and fit for use ; and being possessed of a moving pump or a skip, pump the water into a hogshead, with a leather pipe, and a watering rose at the end of it, just as is practised in watering the streets in London, and so (having the hogshead placed on a roll) may both meadows and corn land be watered to a good advantage."—*Practical Husbandman*, vol. i. page 74.

" To shew an acquaintance of mine the effects and advantages of Salt properly applied to vegetables, I made the following experiment, in an extreme dry summer, upon a bare piece of pasture land, out of which the cattle were all taken for want of grass : I marked four places with stakes, each of which I watered nine nights successively, in the following manner :—the first with spring water alone, to the quantity of a gallon ; the second with the same quantity of water, adding an ounce of common salt ; the third and fourth with the same quantity, mixing the water in the third place with two ounces of salt ; and that in the fourth with three ounces, which produced the following different effects.

" The grass in the second place grew more and of a darker green than that in the first ; in the third, it only grew by spots, for a part of it was killed where the greatest quantity of water fell, and the fourth was quite brown for a greater compass than the third ; by which it appeared that an ounce of salt in a gallon of water had a better effect than the water had alone ; and that three ounces of Salt, mixed with a gallon of water, was more than the grass could immediately receive ; but the fourth place in the ensuing spring was the most fertile of them all."—*Treatise of Fruit Trees*, by Thos. Hitt, 8vo. third edition, London, 1768, page 17.

" Having tried Salt upon a small scale on a sandy soil, I can assert sixteen bushels to be a proper quantity for one acre. It gradually advanced in its effects to sixteen, and as

gradually diminished to forty bushels, when vegetation was destroyed. Twice only have I had an opportunity of buying a few tons of foul Salt, and used it both times on a barley tilth, sowing the salt immediately after the barley. The event was perfectly satisfactory. The verdure of the spring exceeded any thing of the kind I ever saw; and the ripened appearance was whiter by many shades than I ever beheld. N. B. Salt is noxious both to weeds and vermin." R. Legrand, Esq. *on Manures, in the Annals of Agriculture*, vol. v. page 149.

"Salt," says Mr. Hollinshead, "will be found to be the cheapest, best, and most durable manure ever yet made use of."

"When Salt is used upon pasture-lands, it may either be sown upon them in its simple neat state, after the rate of sixteen bushels the acre, or mixed with compost, mud, or loamy earth; sixteen bushels of Salt to twenty loads of earth, and turned in the heap two or three times to incorporate it properly; this compost should be laid on and spread in the autumn."—Page 13—18.

"For meadow-lands, we would advise the farmer to sow *six* bushels of Salt per acre, immediately after the hay is got in. This would be found peculiarly beneficial in hot and dry summers, and upon lime-stone and sandy soils; which, after they are mown, are often so much parched by the heat of the sun, that not only the eddish is destroyed, but also the crop of the ensuing year is very materially injured; but by sowing it with Salt, moisture would be attracted and retained, sufficient to assist vegetation so powerfully, as in a short time again to cover the face of the ground with grass, and by that means effectually to screen the roots, which would otherwise be too much exposed to the direct rays of the sun.

It may, indeed, be said, that dung will answer the same purpose: in some degree it might, but dung cannot always

be had, never in sufficient quantities: besides if it could, this objection lies against it, that neat cattle will not eat the eddish after dung, consequently one valuable crop is lost to the farmer, which, if Salt were used, would be both productive and wholesome. Also, the hay, when put into the mow or stack, should be sprinkled with salt on every layer. When hay is housed soft, this should never be omitted, as it would prevent what the farmers call the *mow-burn*, and make the hay far more pleasant and nutritious for the cattle in winter."—Page 18.

"Mr. Beck, gardener in Chorley, has constantly made use of Salt in his garden for upwards of thirty years, principally upon his onions; and he has invariably found the Salt to exceed every other kind of manure which he could have used for the like purpose; his method is, to sow the Salt immediately after the seed is covered in. But as he never had any thought of communicating his observations and experiments to the public, he took no care to ascertain the exact quantity necessary to be sown on an acre, and proportionably upon any smaller quantity of ground: yet he thinks, if he might hazard a conjecture, that he has not sown *less*, and probable *more*, (of waste Salt) than *sixteen* bushels per acre. One year, by way of trial, he sowed the usual quantity of Salt upon a plot of onions, *after* they had begun to shew themselves above ground, and the crop, so far from being improved, was entirely spoiled; from this he infers, that the experimental gardener, who may be inclined to make use of Salt, will do well to throw it on as soon as possible after the seed is sown."—Page 20.

"A farmer at Glasson, near Lancaster, has for some time been in the habit of carting Salt-water to put upon his dung whilst in the heap in the yard, before it was taken to be spread upon the ground, which he has found by experience very much enriches the dung, and makes it better manure. A great advantage might also be derived to the far-

mer from spreading sea-sand under and amongst the dung, whilst it is in collecting, during the winter, and also in the cow-house, stable, and yard, not only on account of the particles of the Salt contained in it, but likewise by its retaining and absorbing the urine of the cattle, which is itself a very excellent manure."

"A farmer in the county of Sussex, some years ago, had a field, one part of which was very wet and rushy, and the grass produced upon it was of so sour and unpleasant a kind, that the cattle would not graze upon it; he tried several methods to improve it, but to little purpose; at last, having heard of the benefits of Salt as a manure, he determined to try that; for which purpose he procured a quantity of Rock-Salt, which in a random way, without any regard to the precise quantity, he threw upon this rushy ground, fencing it off from the other part of the field; the first effect of which was a total disappearance of every kind of vegetation. In a short time after, however, it produced the largest quantity of mushrooms ever seen upon an equal space of ground in that county. These in the spring following were succeeded by a most plentiful and luxuriant crop of grass, far exceeding the other part of the field in the richness of its verdure and the quickness of its growth: the cattle were remarkably fond of it; and though the Salt was laid on it *upwards of twenty years ago*, this part is still far superiour to the rest of the field."—*Appendix to Mr. Hollinshead's pamphlet*, page 33—35.

"Salt is the mother of all manures, as every kind of manure is higher or lower in value according to the Salt it produces; and every kind of manure is portioned out to the land according to the quantity of Salt or nitre it is thought to have in it. Formerly, Salt was thought to be an impoverisher of land, but experience has taught us wisdom: it is now found to be otherwise, provided it is duly proportioned to the state the land is in, and mixed to mollify it as follows:

take ten bushels of Salt, and six bushels of dry ashes, and mix all together; then spread them on the land, and harrow them in with the seed: this is a sufficient dressing for an English acre, as it is better to repeat the dressing than to lay too much on at once. By being thus mixed, one particle incorporates and mollifies the other. Salt itself is rather too severe and harsh in its nature, and if laid too thick on, might prove of bad consequence; but if conveyed into the earth by a soapy, smooth method, will prove the real enricher the earth wants to send forth vegetation; this dressing will last for three crops. Sea-weed, shells, fish, sea-water, sea-sand, have in them a proportion of salts or nitre, and, therefore, must be esteemed a manure."—From C. Varley, Esq. *communicated to the Chester Chronicle by the Rev. B. Dacre of Mosely near Manchester.*

"The following curious anecdote may be related as serving to illustrate the effect of Salt: Mr. Seckler made a little heap of earth in the midst of a field, on the top of which a cart load of refuse Salt was thrown; the earth in the heap itself, and (after its removal) the earth under it, for upwards of two feet deep to the clay; was rendered so perfectly barren, that the most common weeds would not vegetate in it. This barren earth, however, furnished the richest dressing for the remainder of the field. Mr. Seckler found Salt the best preservative against the mildew in wheat. When the wheat followed turnips with Salt, it escaped the mildew which attacked other fields which were not salted; and this he finds to hold universally good, as far as his experience goes. The improvement of bad hay, by Salt applied in the proportion of about one hundred weight to three tons, and sprinkled between the layers, is very striking, preventing mildew, and rendering it more grateful and beneficial to cattle, especially if the hay is bad: and even in good hay it is very greatly ameliorated. A testimony in favour of the benefit of Salt is furnished by the striking fertility of the

land in the neighbourhood of the sea-shore in Cornwall; more especially in those situations which are favourable to the general distribution of the saline spray, as is exemplified in the parish of Fennor."

"An interesting detail from the Rev. E. Cartwright will be found in the fourth volume of communications to the Board of Agriculture, which is conclusive, as to the application of Salt as a manure for potatoes. It appears from this communication, that the experiment could not have been tried on a soil better adapted to give impartial results: Of ten different manures which were resorted to, most of them of known and acknowledged efficacy, one only excepted, *Salt* was superior to them all. Its effects, when combined with soot, were extraordinary, yielding in a row two hundred and forty potatoes, whilst one hundred and fifty only were produced from the row manured with lime. It was observable also, where Salt was applied, whether by itself or in combination, the roots were free from that scabbiness which often infects potatoes, and from which none of the other beds (and there were in the field near forty more than made part of the experiments) were altogether exempt."

"Sea-sand is very generally used in the county of Cornwall for manure, and the quantity which is every season carried away from different parts of the coast for the purpose of manure almost exceeds belief. From Bude, in the parish of Stratton, it has been ascertained that in one day as many as four thousand horse-loads have been taken; and from the harbour of Padstow, it has been computed, that fifty-four thousand cart loads are annually carried. The expense of land carriage for sand, used in the county, has been considered as amounting at least to thirty thousand pounds annually.

"That the beneficial operation of this sand depends upon the presence of calcareous matter, there cannot be any doubt, but, at the same time, we are borne out by unequivo-

cal facts, in believing that the Sea-salt, with which it is impregnated, contributes materially to its fertilizing powers."—Dr. Paris' *Memoir in the Transactions of the Royal Geological Society of Cornwall*, vol. i. 8vo. London, 1818, page 193.

Extracts from Papers published by the Right Honourable Sir John Sinclair, Baronet, on the Uses of Salt for Agricultural Purposes.

"Salt, if employed in *large* quantities, in its natural state, is hostile to vegetation, yet it operates advantageously, in various ways, when judiciously applied to arable land. In large quantities it has a tendency, like every other excessive stimulant, to disorganize and destroy the vegetable substances with which it comes in contact; but in *moderate quantities* it promotes the growth of vegetables.

"It has been proved by Pringle, and Macbride, that though Salt will, in large quantities, prevent putrefaction, owing to its antisceptic properties, yet that it has an evident tendency to promote the process, when used in small quantities. Hence the advantage of mixing it in moderate quantities with farm-yard dung, and other animal and vegetable substances.

"An experiment was tried in Cheshire, of mixing grass roots and other rubbish harrowed off the land, with foul Salt; it was then incorporated with other manures; and the effects of this compost, on a crop of barley and grass seeds, is said greatly to have exceeded the most sanguine expectations that had been formed of it.

"A farmer mixed up a quantity of refuse Salt with the earth taken out of water furrows, and another portion of the same earth with lime. Of the two, the vegetation of that part of the field which had the *salt compost* laid upon it, was by far the healthiest and most vigorous.

"*Vermin.* Salt destroys vermin in the ground, by making them void the contents of their bodies, such evacuations being too powerful for them to withstand. It has this additional advantage, that the vermin thus become food for those very plants, which otherwise they would have destroyed.

Turnips. "Equal quantities of salt, and of turnip seed, were tried on a small plot of a garden, by the author of this paper; and the produce was more abundant than from the same quantity of turnip-seed sown without Salt. The efficacy of Salt, as a destroyer of the turnip fly, or beetle, ought to be ascertained."

ON THE ADVANTAGES OF OXEN IN PREFERENCE TO HORSES.

Brighton, 10th Feb. 1820.

DEAR SIR,

THE decision of the Committee on the last ploughing match, caused some animadversion, in consequence of their rejecting the performance of Mr. DERBY's plough on account of his *horse* team. It has also led to inquiries, as to the relative merits of oxen and horses for *road* teams; and as you will observe, that the Trustees have excluded horses from competition at the next ploughing match, it is desirable to collect all the experience possible, of the advantage of oxen in preference to horses for the *road;* and I believe, sir, no person can afford more practical information on the subject than yourself, from the important use of ox teams in the war of the revolution, particularly while you was quarter-master-general. Though a stripling at that period, I can well recollect, that the principal transit of stores and provisions for the army, from New-England, was performed by ox-teams. This fact was confirmed by Dr. EUSTIS in a

late conversation relative to the present object of inquiry, who at the same time remarked, that the heavy ordnance intended for the siege of York-Town, could not, without great delay and difficulty, have been brought up, had not the quarter-master-general had the *foresight* to order *oxen* from New-England for that service. These facts are, in my opinion, of importance to the Agricultural interests of the nation, and should be promulgated.

Will you have the goodness, sir, to communicate such information on the premises, as may occur to your recollection.

With particular esteem,

I am respectfully, yours,

S. W. POMEROY.

Hon. TIMOTHY PICKERING.

Wenham, Feb. 29, 1820.

DEAR SIR—

IT was not till yesterday that your letter of the 10th instant came to my hands. With pleasure I comply with your request, by communicating what knowledge and information I possess, of the use and value of oxen for the road, and for all the labours of husbandry.

You particularly mention the employment of ox-teams, in the public service, in the war of our Revolution. The considerable destruction of horses in the operations of the war, and the great expense of procuring and supporting them, induced me, in the winter of 1780—81, (at which time I held the office of quarter-master-general,) to cause ox-teams to be provided for the campaign of 1781. These were obtained, of course, in New-England, where alone they could be furnished: and they fully answered my expectations.

When in August, 1781, disappointed in the expected co-operation of a French fleet, against the enemy in New-York, the commander-in-chief decided on the expedition against the British army under lord CORNWALLIS, in Virginia, I received his orders to provide for moving the troops destined for that service. The ox-teams effectually performed the transportation of baggage and stores, to the points where they were relieved by water-conveyances. From the head of Elk, in Maryland (sixteen miles eastward of the Susquehannah,) to James' river in Virginia, the ox-teams, (without loads,) travelled expeditiously. The heavy artillery, shot, shells, &c. brought from the head of Elk, by water, were landed on the shore of James' River, I think at or near James' Town, whence they were transported by the ox-teams, to our camp before Yorktown, a distance, I believe, of about fourteen miles. In the performance of this service, those teams were of essential importance.

The late Col. JEREMIAH WADSWORTH, of Connecticut, (one of the most judicious and efficient men in business that I ever knew,) was then the contractor for supplying the French army with provisions, teams, carriages; in a word, with every thing necessary for it, in the quarter-master's and commissary's departments. I introduce his name, because he had provided a great number of ox-teams and waggons, for the use of the French army during the same campaign; and these also travelled to Virginia.

I always understood that the great transportation of provisions and stores, from Massachusetts and Connecticut, to the troops on Hudson's river, was almost wholly performed by ox-teams, during the war.

Just at the close of the war, in the summer of 1783, I recollect being at the house of an Agricultural gentleman of Princeton, in New-Jersey, where Congress was then sitting; and that CHARLES THOMPSON, the Secretary, was present.

One of ARTHUR YOUNG's Agricultural Tours, in England, lay on the table, and gave rise to a conversation on the use of oxen for the draught, particularly when geared with collars, hames, and traces, like horses; and Mr. THOMPSON, related the following fact, now, for substance, perfectly in my recollection. Travelling in that part of Chester county, in Pennsylvania, which lay between Lancaster, in that state, and Newport on Christiana Creek, Mr. THOMPSON fell in with a team of a novel character in that country, being composed of one pair of horses and one pair of oxen; *and the latter were accoutred with harness like horses, only with the collars turned upside down.* His curiosity being excited, he stopped, and made some inquiries; and received from the driver an account as follows; that he and a neighbour, each having a horse-team and waggon, had entered into a contract to transport a quantity of flour, (I think in a given time,) to Newport: that in the midst of the work, one or two of his horses failed, (fell sick or died,) and he was not in circumstances conveniently to procure others; but he had a pair of oxen, and he concluded to try whether they would supply the place of his horses; that he made the experiment and succeeded. He told Mr. THOMPSON, that the oxen were more useful to him than horses; for after some fall rains, when the roads had become miry, he continued to carry his full complement of barrels of flour, while his neighbour's horse-team frequently getting *stalled*, (the familiar term in Pennsylvania, when a team gets set fast in a slough) compelled him to lessen his loads. But he added, that in returning from Newport with their waggons *empty*, his neighbour had the advantage in *speed*; although none in the actual performance of the contract.

Horse-teams for the *road* are universal in Pennsylvania; at least, in the many years I resided there, I do not recollect observing any other. But I have noticed some of their

teams of large horses travelling at as slow a rate as any loaded ox-teams in New-England.

I have been inclined to entertain the opinion (perhaps an erroneous one) that oxen might be trained (beginning with their first acquaintance with the yoke) to a greater quickness of movement than is common; and that this might be rendered habitual. I have seen a pair of oxen in a plough keep pace with another plough drawn by a pair of horses. And Sir JOHN SINCLAIR, in his account of the Improved Scottish Husbandry, mentions two distinguished farmers, of the name of WALKER, who, contrary to the general practice of their neighbours, persisted in the use of ox-teams, as profitable on their farms. Two oxen, harnessed like horses, in a plough, performed the same labour, without losing a turn. After the experience of twenty years, these farmers pronounced oxen fit for every agricultural labour, travelling on *hard turnpike roads* excepted.

It would seem that horse harness is generally, if not universally used for oxen in Scotland, the collars being reversed. Sir JOHN SINCLAIR says "the principal objection to the use of oxen is the difficulty of shoeing them." The facile mode of shoeing oxen in New-England, would remove that objection: and I take the liberty of suggesting the propriety of the Trustees of our State Society of Agriculture, communicating to Sir JOHN, a drawing and description of our simple frame and apparatus for shoeing oxen, for the information of British Agriculturists, to whom we are so much indebted for instruction and examples in the most approved practices in Husbandry.

I subjoin, from Sir JOHN SINCLAIR's book, his statement of the expense of supporting *one plough*, in Scotland.

Mr. BROWN of Markle keeps twenty work horses.

The food of each, in 1812, was	£35	0	10
Interest of money, wear and tear,	7	10	0
			£42 10 10

Amount brought over -	£12	10	10
The same for the second horse, -	42	10	10
Horse tax, smith's account, and keeping in use harness and implements, - - - - -	12		
Total expense for one pair of horses, -	£97	1	8
The Ploughman, including all emoluments,	38		
Total expense of one plough, in Sterling money, - - - - -	£135	1	8

In dollars, 599 72; 28 cents only short of $600. For the horses alone £97 1 8, equal to $431. Does the support of a pair of good working oxen cost a New-England farmer more than a fourth part the latter sum? It is true, that the open weather of a British winter enables the farmers to plough and do other farm work during a good, perhaps the greater, part of that season; and consequently their horses require good feeding then, as well as in other seasons.

The WALKERS break their steers for work at three and a half years old, and work them till they are six and a half, when they are fattened. "The ox improves, (Sir JOHN remarks) until six or seven years old; and is then easily fed and brought to market, at a greatly increased weight and value." Another Scotch farmer breaks his steers at two years old, giving them only light work so as not to prevent their growth. At that early age they will be more docile. Such, and for the same reason, I suppose, is the common practice of New-England farmers. Besides that an ox ceases to gain in size after he is six or seven years old, he perhaps begins to abate somewhat in his activity; and both these reasons may operate with the WALKERS then to fatten them.

I am pleased that the Trustees of the State Society, "have excluded horses from competition at the next plough-

ing match." We have done the same for our first essay in Essex: because we would not encourage the substitution of horses for oxen, in the great labour of a farm.

I am, dear sir, with great esteem,

Your obedient servant,

TIMOTHY PICKERING.

S. W. POMEROY, Esq.

First Vice President of the Massachusetts Society for promoting Agriculture.

Wenham, April 22, 1820.

DEAR SIR—

SINCE the perusal of your letter of the 3d instant, in reply to mine on the subject of ox-teams, there has occurred to my recollection a paper, to the same point, in the first volume of the Memoirs of the Philadelphia Society, for promoting Agriculture: it is a letter from William Ashford, to John Vaughan, Esq. Mr. Ashford, says—"There is another thing in which I was wrong in not taking your advice, viz. not keeping oxen instead of horses: this spring all my horses became sick, and I was forced to buy a pair of oxen. I supposed I should be tired of them; but on the contrary, I am tired of horses; as I find that with my two oxen, I can do more work than I could with four horses, and with half the expense. I have worked horses for forty years, and if I had used oxen in their place, they would have put five hundred pounds in my pocket. My oxen go to the lime kiln once a week, twenty-one miles, in the morning, and return the next day in the forenoon: after resting two hours, they go to work—horses cannot do this."

This testimony of an experienced farmer of Pennsylvania, whose prejudices were opposed to the use of

oxen for labour, and where horses, with very few exceptions, constitute the farmers teams, is peculiarly valuable.

I am, dear sir, with great esteem,

Your obedient servant,

TIMOTHY PICKERING.

S. W. POMEROY, Esq.

ON INDIAN CORN AND ITS CULTURE.

Brighton, 29th Dec. 1819.

[To the Corresponding Secretary.]

DEAR SIR,

IN an article published in the 4th number of the last volume of the Agricultural Journal, entitled "Remarks on the Agriculture of Massachusetts," the author, who very ably and satisfactorily points out the advantages of a regular rotation of crops, observes, that "no system is likely to be easily made popular in Massachusetts from which Indian corn is absolutely excluded."—May not strong reasons be offered, why any system to be generally practised, must embrace that grain as a prominent item of the course? It forms the basis of our bread-stuff, and gives deserved reputation to two great staples, *Beef* and *Pork;* without corn you get none of the latter;—and a farmer who has no pork in his tubs, may be considered as fairly on the road to ruin, as a Bank with its vaults destitute of *specie*, for it is well known that ruta baga, potatoes or carrots *alone*, will not fatten such pork as our farmers or fishermen have been accustomed to, or that will be found profitable for consumption.

A *Virginian*, in a Treatise* which I have lately perused, remarks, that "even a nation which has lived with *Indian corn* and almost upon it for two hundred years, so far from correctly estimating its value, have only learned to eat it, but not to avail themselves of half its properties." And I trust it will not be deemed superfluous to portray the advantages resulting from its culture, to *New-England men;* when it is considered that the *prejudice* against it, and which will exist against any crop that requires such diligence to obtain, has been fostered, and increased by the few unfavourable seasons preceding the two last—besides, some influential gentlemen, with views highly laudable, have advanced theories, founded on isolated facts, or opinions, tending to discourage the extensive cultivation of this plant.

It is admitted, that on most farms near sea ports, where corn and *manure* can be purchased, the system of potatoe and root culture, to the *exclusion* of corn, may be found profitable; nor would I be understood other than an advocate for such a system, in a regular rotation, upon an extensive scale; but I wish at the same time to hold up to view, the Golden Fleece found by our *Pilgrim Fathers* on their first landing; and which, had it not existed, or continued with their descendants nearly a century after, the *fair inheritance* we now possess, in the opinion of many sound political economists, could not have been transmitted to us.

Unfortunately we have no precise data, to test a crop of corn with other productions; and in considering its value, must have recourse to general reasonings—to the effects of

* A series of Agricultural essays entitled Arator, by Col. John Taylor of Caroline County, Virginia.—Though adapted to the agriculture of that, and the adjoining states, will be found to contain valuable practical and useful information to the New-England Farmer.

its extended culture since the settlement of the country, and particularly since the introduction of its pretended *rival* and valuable *auxiliary* the potatoe.

Let us inquire in the first place, what corn-husbandry returns from an acre of land, as usually managed. On suitable soils well tilled and manured, an average crop may be estimated at *forty bushels*, weighing 2400 lbs. of the most nutritious substance to be found in the vegetable kingdom, north of the latitude of the *sugar-cane*—and which can be preserved with ease, for a number of years.—you have the *fodder*, if seasonably and well cured, is, in the opinion of judicious farmers, equal to half a ton of good *hay*—then comes three or four tons of *pumpkins*, should the season favour, fifty or an hundred bushels of *turnips*—and, not unfrequently, a comfortable supply of *white beans!*—No wonder that plenty of the necessaries of life, are as sure to follow large crops of corn, as effect succeeds cause in any department of physics!

I am aware that it is the general opinion that corn is a very exhausting crop,—much more so than potatoes; but is it correct? has there ever been exhibited the result of a solitary experiment to confirm this opinion? no process in farming admits of greater facility to test a question of this kind—few farmers but have at times, corn and potatoes under similar culture in the same field—has the wheat or barley, the clover or grasses that followed, been more productive on the part occupied by the potatoes, than that by the corn? Experience demonstrates that the *larger the crop of corn, the better the succeeding crop;* this was asserted by Dr. Eliot, the father of New-England husbandry, in his *Essays on Field husbandry* published in 1747; at which period it appears, that *oats* usually succeeded corn, and possibly, in some districts, such a murderous course has continued; and it is probable that CORN, after support-

ing its *allies*, the *pumpkins*, the *beans* and the *turnips*, from the provisions charged to its account, has to answer for the deteriorating effects of oats ; the most inimical to grass of any plant that can be named. Moreover, it will be recollected that formerly, the rich alluvial bottoms or intervals were planted with corn, without a particle of manure, for a number of years in succession, till the product was considerably reduced;—would *potatoes* or any *root* crop, with such management, have continued more productive? and hence, has not the reputation of corn materially suffered?

We will next inquire, what return does corn make to the SOIL? I cannot answer so well, as by quoting from *Arator*, the treatise before alluded to. "Indian corn may be correctly called meal, meadow and manure ; it produces more food for man, beast and the earth, than any other farinaceous plant. If the food it produces for the two first was wasted, and men and beasts should thence become poor and perish, ought their poverty or death to be ascribed to the plant which produced the food, or to those who wasted it? Is Indian corn justly chargeable with the impoverishment of the earth, if the food it provides for that is not applied?

"If the theory which supposes that plants extract most or all of their matter from the atmosphere, and that the whole of this matter is manure, be true, then that plant which produces most vegetable offal must be the most improving crop, and it will hardly be denied that Indian corn is entitled to this pre-eminence."

"Let us compare it with wheat. Suppose that the same land will produce as much grain of the one as of the other, which in its use will make equal returns to the earth. Here the equality ends, if indeed it exists even in this point. The corn stalks infinitely exceed the wheat straw in bulk, weight, and a capacity for making food for the earth. If any attentive man who converts both his stalks and straw into manure, will compare their product in April, when he

may distinguish one from the other, he will find in the former a vast superiority in quantity. The English farmers consider wheat straw as their most abundant resource for manure, and corn stalks are far more abundant ; corn therefore is a less impoverishing, because a more compensating crop to the earth, credited only for its stalks, than any in England. In comparing crops, to ascertain their relative product, and operation on the earth, we must contrast farinaceous crops with each other ; and consider the litter or offal they produce, not as wasted, but as judiciously applied to the compensation of the land. At the threshold of the comparison, corn exhibits a return from the same land of more offal, or litter, in its stalks alone, than wheat does altogether. But to the stalks of corn, its blades, tops, husks and cobs, remain to be added, each of which will nearly balance the litter bestowed on the land by wheat." The author concludes his encomium upon Indian corn, with observing, that "as a fallow crop, it is unrivalled, if as fallow crops ought constantly to do, it receives the manure."

Arthur Young who has given such an impetus to rural economy, and to root culture particularly, in Great Britain ; in his travels through France in 1789, makes the following remarks respecting Indian corn. "The line of maize (corn) may be said to be the division between the good husbandry of the south and the bad husbandry of the north of the kingdom, till you meet with maize very rich soils are fallowed, but never after ; perhaps it is the most important plant that can be introduced into the agriculture of any country, whose climate will suit it. The only good husbandry in the kingdom, (some small rich districts excepted) arises from the possession and management of this plant. For the inhabitants of a country to live upon that *plant*, which is the preparation for wheat, and at the same time keep their cattle fat upon the leaves of it, is to possess a treasure, for which they are indebted to their climate."

"Planted in squares or rows so far asunder, that all imaginable tillage may be given between them; and the ground thus cleaned and prepared at the will of the farmer, is an invaluable circumstance; and finally it is succeeded by wheat. Thus a country, whose soil and climate admit the course of—1st. maize, 2d. wheat, is under a cultivation that, perhaps, yields the most food for man and beast, that is possible to be drawn from the land."

This celebrated agriculturist, a few years after his return from his travels, met with a native of *Connecticut* in London, and on being informed of the face of the soil and population of that state to a square mile, observed, "they must consume all, or more than they raise!" but when told that a large surplus was exported, expressed his astonishment; and eagerly inquired "what is their principal culture?" the reply was, "*Indian corn.*" He immediately remarked "that accounts for the wonder." The culture of corn still enters largely into the agricultural system of Connecticut,—and what is the consequence? Let one of her most revered* poets answer.—

"Fell Famine sickens at the o'erflowing good
"And, hissing, flies the native land of food."—

A general failure of the crops of corn in New-England, cannot be traced to more than four seasons since its first settlement, and those, occasioned principally by autumnal frosts, and owing in some measure, perhaps, by an improper choice of soils. The last failure (1816) might in a great degree have been prevented, had proper attention been paid to this circumstance; and also to the selection of *early varieties for seed*, as it is a fact, that there are very productive varieties in the country, which, if planted the first of June, will be secure from frost the first of September!

* The late President Dwight.

The mode of culture generally in Massachusetts does not differ essentially, from that taught our ancestors by the aborigines ; warm soils were chosen—an *alewife* or some other *fish*, was put into the ground with the seed, and as the Squaws had no other implement than a *clam-shell*, hills were formed with the earth that could be most easily obtained ; and hills have been the order to the present time. Is it not probable that, unincumbered with stumps and rocks as a great portion of the arable lands of the state now are, and with the vast acquisition of implements, that a different process would produce much greater crops, with less labour ? We have seen by publications, under the sanction of respectable societies in the western parts of the state of New-York, that on *ridges* or in *rows*, more than one hundred and twenty bushels of corn have been obtained from an acre ! three times the quantity we estimate as an average crop ! It is true that our soils cannot boast the fertility of that new region ; but it is also as true, that our farmers will not yield to any for enterprize and perseverance.

The introduction of that *magic substance*, gypsum or Plaster, which exhibits such astonishing effects upon corn, and is obtained almost as cheap as sand from the sea beach, has begun to form a new era in the husbandry of the state ; may we not presume, that by the aid of this substance mixed with manures, in their raw state, and also applied as top dressings of the plants at every time of hoeing, till six or eight bushels are expended to an acre, instead of one or two, as is usual, that the most encouraging results may be expected ? The utility of plaster, has been tested in almost every town in the state, situated 15 or 20 miles from the sea board. The invention of machines for its more easy pulverization, and so cheap, as to be within the reach of any considerable farmer, is a desideratum.

The perfect culture and copious manuring demanded by corn, may be said to be the principal objection to its more extensive cultivation; ought not this to be the very feature which should recommend it? Has not the Drill husbandry been the means of exalting BRITISH AGRICULTURE beyond that of any other country? and what is a well managed field of Indian corn, but a most complete drill system? The depth the roots will penetrate, if encouraged, and from the structure, and volume of the stalk and foliage presented to the atmosphere, it seems peculiarly adapted to resist the severe droughts of our climate;—its superiority in this respect over any other crop we cultivate, I believe will not be questioned. And, if the agriculture of New-England has heretofore been entitled to any pre-eminence, compared with that of other sections of the union, the cause may be attributed partly, perhaps, to the more general use of *ox-teams*, but principally to this thorough tillage required by our soil and climate,—and for which the most grateful returns are made.

On the whole, the conclusion, to my mind, is irresistible, that should Indian corn be made the basis of an extensive rotation system, with a pointed attention to the manures, which it has the capacity to increase in a compound ratio, the agriculture of Massachusetts may not only approximate to that of Great Britain, but with the energies such a system might be expected to elicit, equal it.

The eulogist of Indian corn, whose method of cultivation differs from that of his neighbours, may be expected to submit some account of it; and I feel less reluctant to the task, since I find a mode very similar, and with corresponding views, has been practised and recommended by such an accomplished cultivator, and physiologist, as Col. Taylor, the author of the treatise before referred to. It may be proper to state, that I was induced to adopt this method from the following occurrence. Having a large bed of

Beets planted in narrow rows or drills, in the usual way, and a severe drought ensuing, the leaves were observed, in the middle of the day, to wilt and fall down, in all but the out-side rows, which remained erect and flourishing; and when the crop was taken up, were nearly double the size of those from the centre of the bed! That a greater exposure to the atmosphere, was the principal cause could not be doubted; and the idea immediately presented, that if they had been cultivated on *ridges* so far apart as to permit a plough to pass, it would in effect, be making the whole crop *out-side-rows*: and for upwards of fifteen years since, all the arable crops upon my farm have been cultivated on ridges with manifest advantage,—as to product, labour, and the *unquestionable* improvement of the soil. The ridges of beets, carrots, parsnips, turnips and ruta-baga, are about two feet, cabbages four, and corn and potatoes five feet and an half apart. The particular mode of cultivating carrots was communicated to Hon. Mr. Quincy in 1811, and included in an article on the *field culture of carrots*, furnished by him and published in No. 1. of the 4th Vol. of the Massachusetts Agricultural Journal, a mode practised by that gentleman with such success, that his neighbours who have large *milk establishments*, have been induced to adopt the extensive culture of this root, so valuable for their cows, and which, some of them have informed me, they should have been deterred from attempting in the common method, from the expense and uncertainty.

But to return to the culture of corn; in describing which, that of potatoes must necessarily be embraced; as I deem it a species of *heresy* for two crops to succeed each other when it can well be avoided; nevertheless, as potatoes should be employed as the *pioneers* of a farm, and it is frequently the case that cold, moist, or rough soils, not suitable for corn, are found, sufficient to be occupied by as many potatoes as the farmer can well manage, or may want, under

such circumstance, the permitting two crops of corn to follow, *on ridges*, may be justifiable; whereas in the common method it should be considered as unpardonable.

If we begin the system with *sward* land, it is broken up in the autumn; harrowed fine in the spring, and light furrows run out five feet and an half apart: into these furrows, potatoes are dropped from six to eight inches asunder, according to size, the carts follow and cover them with manure; a furrow is then turned from each side so as to meet over the manure, a little labour with the hoe may be required, to make all level and complete the planting; other furrows are turned up, and at the first hoeing the baulk is cleared and the ridge completed. In the subsequent culture the plough approaches only the sides of the ridges, and continues deepening the furrow between them. The following spring, the ridges are reversed and placed directly over those deep furrows. The manure is turned in while the ridges are forming; or by opening a furrow on the top, to receive it, with a pair of oxen walking on each side, covered with hoes and the corn planted. If the land is in good heart, and manure abundant, the kernels may be six inches apart, or as many dropped together as to insure four stalks to remain two feet apart, in which case the manure is deposited conformably; either method will give the same number of plants to the acre; I think four stalks together afford support to each other against winds, and are not so apt to send up suckers as when single, and there may be some advantage by concentrating the manure, in forwarding the young plants during the cold seasons which we frequently have in June; still I have not had sufficient experience to determine which method is preferable; if the land is *stony*, the last will be found most convenient. As soon as the plants appear, the earth is stirred about them with the hand, and ashes at the same time strewed on, in the proportion of a handful to four plants, (my land being

near the sea, plaster has no effect,) the cultivation proceeds similar to that described for the potatoes—the ploughing continues as often and as long as you please, without disturbing the roots of the corn, or breaking it down, deepening the soil and turning up the dead earth to the sides of the ridges, which checks the growth of weeds greatly ; and if the crop is at first thoroughly hand weeded, they will give but little trouble afterwards.

It has not been in my power to make a comparison with a crop cultivated in the common method, but I have had several foremen since ridging has been practised on the farm, who were at first prejudiced against it, but were soon convinced of its utility ; and none of them have estimated the increase of product, with the same quantity of manure, at less than one fifth, and the saving of labour full as much.

It is probable that on rich soils with plenty of manure, larger crops may be obtained by making the ridges much nearer, but the labour will be more, and the advantage of uncommon deep culture, without extra expense, must be abandoned ; the importance of such culture to the succeeding crops, may be illustrated by the following relation.

About fifteen months since, I was applied to, severally, by two respectable farmers, from an adjoining town, who are considered as judicious and as *thrifty*, as any in the county of Norfolk, to be informed how I had managed a piece of land, the former state of which they had well known, to make it produce such a *second* crop of clover, in such a season of drought, that theirs was *dried up*, and on land naturally more moist, which they considered stronger, and had been well cultivated and highly manured? They were told in reply, that "the land was under the sixth course of a rotation.—viz. 1. potatoes, 2. corn, 3. carrots and beets, 4. corn, 5. spring-wheat, of which it carried thirty bushels of 59 lb. 6. clover, first crop two tons and an half, second the same season, and which had attracted their notice, about one ton to the acre." That it had from 16 to 20 lb. of

clover and half a bushel of herds-grass seed to an acre; one half ploughed in with the wheat, and the remainder sown on the furrow, harrowed in and well rolled: and further, that no stock were suffered to graze upon it." It should also be stated, that a heavy crop of herds-grass was produced the last season, and that it gives promise of another;—that the soil is a deep sandy loam, known to many farmers by the name of *fox coloured earth*, and which some of them are too fearful of turning up; that when first cultivated, in the common method, which was some years previous to the present rotation, it did not shew two inches of brown soil or vegetable mould, and had been considered as poor pasture. And I would observe, that had the land been longer under previous cultivation, the 3d and 4th courses might have been omitted, and the rotation thereby shortened two years.

I will close this communication, now much longer than was intended, by mentioning that I have found the following preparation of SEED-CORN, effectual in protecting it against squirrels, and other vermin. Take equal parts of tar and train oil, simmer them together and turn over the corn; then sift on ashes, lime, or plaster, stirring it, till each kernel has taken up as much as will permit its being conveniently handled.

It is probable that *walnuts*, *acorns*, *chesnuts*, &c. thus prepared, would be protected; the destruction of which by squirrels, has very much retarded plantations of those valuable trees.

I remain dear sir,

respectfully and cordially, yours,

S. W. POMEROY.

JOHN LOWELL, ESQ.

Corresponding Secretary of the Massachusetts Society for promoting Agriculture.

REVIEW OF A "TREATISE ON AGRICULTURE, COMPRISING A CONCISE HISTORY OF ITS ORIGIN AND PROGRESS—THE PRESENT CONDITION OF THE ART, ABROAD AND AT HOME; AND THE THEORY AND PRACTICE OF HUSBANDRY, WHICH HAVE ARISEN OUT OF THE PRESENT STATE OF PHILOSOPHICAL ATTAINMENTS IN EUROPE. BY A PRACTICAL FARMER." Albany: printed by J. Buel, 1820.

THERE is no department of knowledge, (we have not the temerity as yet to call it science) to which the attention of the people of Europe, and of the United States, has been of late more assiduously turned, than to that of Agriculture. Of its importance, compared to that of any other art or science, there cannot be any division of sentiment; it being unquestionably the most important, and the source of the prosperity and success of all other arts and sciences.

Yet it has so happened, probably because its professors and cultivators are less instructed and informed, generally, than those, who are employed in the other departments of human knowledge, that it has hitherto been in low estimation; and it has been taken for granted, that this, of all other arts the most important, can be brought to perfection by unassisted experience, and that science cannot, as it has in all others, contribute to its amelioration and perfection. It would be difficult to assign the reasons for this general prejudice against the application of principles of sound reason and philosophy to this important art. Perhaps they may be found in the unsuccessful *practical* exertions of men, who have cultivated it theoretically. They have generally lost money by their experiments; and the practical, but less informed cultivator, who has been a greater gainer upon the amount of labour and capital laid out on his farm, has been disposed to ridicule the expensive experiments of his better informed neighbour, which, owing to

his want of practical skill, have been more expensive than profitable to him.

Yet if this rule were applied to the other arts which contribute to the wealth and prosperity of a nation, it would be perceived, that the ingenious artists, who are the inventors of machines for the abridgement of human labour, or for perfecting of the various processes of manufacturing industry, are generally victims to their own ingenuity and zeal, and that it is, after all, only the practical man, unacquainted with the principles on which the improvements were effected, who has derived any solid benefit from the discovery or improvement. The truth is, that the pioneers in all the arts, are generally destined to die in a poor house, while those who avail themselves of their discoveries and hints, often make for themselves and families an abundant and noble establishment.

In this country, though more decidedly agricultural than almost any other in the world, there have been fewer and more feeble attempts to reduce the art to a science, than in any other country ancient or modern. Till within a few years, our farmers could trust only to the uncertain tradition of their ancestors, and each man followed the practices of his father, or of his neighbour, without knowing what improvements had been made, in other countries, since the emigration of our ancestors. The art must necessarily have degenerated with us, because the mode of culture required in clearing up new lands, must have been essentially different from that, which was applicable, and indeed indispensible to lands which had been long cultivated, and the vegetative powers of which had been in some very considerable degree exhausted. It was only after our lands had been generally cultivated, and worn out by a negligent and careless course of husbandry, that we could expect any effort to supply the defect, which exhausted nature required.

Within a few years our attention has been awakened to the subject, and the effect of this attention can be known only by attending to results. It is believed that only twenty years since, there can scarcely be produced a case in which three hundred bushels of potatoes, or seventy-five bushels of corn, were ever produced on an acre of land.

We formerly read with astonishment and doubt, the accounts of the enormous products occasionally raised on well conducted farms, in Europe. Now we have seen, that partly by an attention to a spirited cultivation, to an increase of the quantity of manure, and by the emulation excited by the rewards offered by agricultural societies, there have been produced crops, which will bear a comparison at least with the average produce of the best cultivated districts of Europe.

The periodical Journals of the various agricultural societies in the United States have been rapidly increasing in their number and interest, and men of science and agricultural experience have also, occasionally, by their publications, done much to awaken an attention to this subject; to enlighten, inform, correct, and improve our modes and processes in agriculture.

Among these efforts, the work mentioned at the head of this article deserves a very prominent place.

It is no undeserved compliment to the author (entirely unknown to us,) to say, that he has enjoyed the rare advantage of an extensive acquaintance with the works of all the nations of Europe, ancient and modern; that his library must have been well furnished—his knowledge of ancient and modern languages much greater than commonly falls to the lot of a "practical farmer." With all these advantages, his work might have been a confused, incoherent and useless display of learning; but it is not such. His arrangement is lucid, and well digested. His selections judicious; and the whole compendium (for it is but a compendium) uncommonly comprehensive and well adapted for the

higher class of cultivators. We use this term, (offensive as it may seem in our republican country), in a very innocent and inoffensive sense. We mean, that his work is rather calculated for the *reading*, than the *practical* part of society; for those who think, rather than those who labour. It ought to be compared with the works of Kirwan and Sir Humphrey Davy, rather than with those of Arthur Young, of Mr. Taylor of Virginia, or of Dr. Deane. Still we hail it as a great acquisition to our stock of works on agriculture. If agriculture is ever destined to become a science, and like that of architecture and shipbuilding, to extend its beneficial influence through society, it must commence its operations by amusing, instructing, and exciting the reading and thinking part of the community. Through them, thoughts and suggestions, which are of value and importance will be disseminated through the whole community. If experience shall prove them to be useful, like the invention of the quadrant and compass, they will be adopted and used by thousands, who know nothing of the principles on which they were proposed or invented; if otherwise, they will fall like many other efforts of genius and talent, to be heard of no more.

The general divisions of this work, and it is but a brief one, are—

SECTION I. Of the rise and progress of agriculture.
II. Of the actual state of agriculture in Europe.
III. Theory of vegetation.
IV. Of the analysis of soils, and the agricultural relations between soils and plants.
V. Of practical agriculture and its necessary implements.
VI. Of manures; their management and application.
VII. Of tillage, and the principles on which it is founded.

VIII. Of a rotation of crops and the principles on which it is founded.
IX. Of the plants recommended for a course of crops and their culture.
X. Of other plants useful in a rotation of crops, and adapted to our climate.
XI. Of meadows.
XII. Of orchards.
XIII. Of Farm cattle.
XIV. Of the Dairy.

Every intelligent agriculturist will perceive, that this synopsis embraces almost every topic interesting to a farmer, and he would expect to find one or more volumes of several hundred pages each; and he would think it impossible to discuss all of them, as this writer has done, in the short space of 168 pages. No doubt much more might have been said, and the work would have been invaluable had the same talent, and knowledge, and industry been employed in giving us a full display on these several topics; but short as it is, it may be safely affirmed, that very few works have ever appeared in this, or any other country, which have given so much condensed and important information in so small a compass.

We do not mean to say, that we concur in all the opinions of the writer; we differ from him in many of them; but we think, that those who have not access to an extensive library on agricultural subjects, will find a mass of information, with regard to the state of agriculture in every part of Europe, which they will find extremely entertaining and useful.

We now propose to give some sketch of the various subjects discussed by the author.

The first section contains a very brief, and rather meagre account, of the history of agriculture among the ancient nations of Europe and Africa.

The second section professes to give the actual state of the agriculture of Europe.

After speaking, with just contempt, of the culture of the Campania of Rome, where formerly twenty-three cities flourished in a territory, in which the modern traveller is astonished and depressed at the silence and desolation around him, he proceeds to Tuscany, where the soil, though less fertile than that of the Campania of Rome, is covered with vines—with grain—and with cattle. The Tuscans have adopted the system of a rotation of crops, which consist of either three or four years, in the following order:

1st year. Wheat, and after wheat, lupins.

2d year. Wheat, and after wheat, turnips.

3d year. Indian corn or millet.

In the four year rotation.

1st year. Wheat, and after wheat, beans.

2d year. Wheat, and after wheat, lupins.

3d year. Wheat, and after wheat, lupinella, or annual clover.

4th year. Indian corn or millet.

It is observable that such a course would only suit a country, whose season is so long, and mild, as that of Tuscany.

The Piedmont and Milanese agriculture is next noticed, and the opinion of Arthur Young is quoted, in which he states that these territories are the most rich and flourishing of any in Europe. The soil in this favoured country yields annually and uniformly, two crops of grain or three of grass. These effects are the produce of irrigation.

France, this writer considers as uniting the great desiderata of an extended and profitable agriculture, fertility of soil, mildness of climate, a dense population, an enlightened government, and facility of exportation, beyond that of any other European state.

This praise, almost without qualification, has induced us to believe that something more than the partiality produced

by a dispassionate examination of the relative state of agricultural improvement in the various countries of Europe, has influenced the opinions of the writer. His intimate acquaintance with French writers; his ample references to them, as authorities, had led us to believe that he was, (though an American practical farmer), a Frenchman by birth and education. Still the merits of his work are in no degree affected by this circumstance, though it may influence his opinions, and materially affect his judgment. It ought therefore to induce us to examine more cautiously his sentiments in relation to the actual state of agriculture in other nations.

The same preference for the agriculture of France has induced the author, when considering the state of English agriculture, to speak rather contemptuously of it. His impartiality is poorly vindicated by admitting some faults in the French system of fallows, and some other more unessential points. For ourselves, we are persuaded from personal observation, that the culture of Great Britain is far superior to that of France.

It certainly is so, as to neatness, and freedom from weeds and noxious plants. You do not see the fields of wheat brilliant with the scarlet poppy, and other flowery plants, which show off the wheat fields of France to so much advantage. You do not see the peasantry so miserably clothed, nor loitering along the highways, watching two or three half-starved cows and sheep, and with the aid of a sagacious shepherd's dog, preventing these animals from making more than half a rod's inroad into the wheat field. We were astonished to hear Great Britain censured for the indifferent management of her *cattle*.

To be sure the author quotes certain British writers in proof of his assertions; but in our humble opinion, these sentiments were thrown out rather to stimulate the English farmers to greater exertions. It would, indeed, be extraordinary, if the French or any other nation should surpass

the English in attention to their animals, since the capital bestowed on such subjects, the institutions in favour of agriculture—the rewards, ten times exceeding those awarded on the continent, ought to produce, (if encouragement and honour can produce any effect,) a greater attention to the improvement of their domestic animals, than could be expected from the meagre and scanty efforts made in the rest of Europe.

In fact, no person who has travelled in Great Britain and on the continent of Europe can doubt, that the races of domestic animals, the horse, the ox, and the sheep, are in a higher state of improvement in England generally than in any European nation. Perhaps we may except the sheep of a small part of Germany (Saxony,) but it is much to be doubted, whether, regard being had to the carcase and fleece, and to the varied uses to which British wool is applied, even the sheep of any part of Europe are superior to those of Great Britain.

The author has given some calculations to shew the low state of agricultural produce and profit in Great Britain. But the Edinburgh reviewers, who cannot be taxed with a disposition to overrate their own country in a comparison with any other, in the 64th number of their review, in a comparison of the state of French and English skill and industry, have seemed at least to make the English agriculture and its relative produce far superior to that of France. Nor is it very easy to perceive, in what the fallacy of their statements consists. By this comparison it would seem to result, that, although the surface of the British Isles is only as 64½ millions of acres to 130 millions in France; and although there are more uncultivated lands in proportion in England than in France; although it is admitted by our author, and by every person who is acquainted with the subject, that the climate of France is superior, yet the actual value of the whole produce of the land in England (the quantity of which is less than one half) is to that of France

as 21 to 19. We confess, after many years acquaintance with both countries, we were prepared for such a result. We have thought the general system of agriculture in Great Britain better; the people employed in agriculture are stouter, more vigorous, better clothed, much better fed; the animals employed in agriculture far superior; the implements of agriculture better made, and better adapted to the purpose incomparably than those of France. The system of living in villages, and riding or walking several miles to begin their work, is disadvantageous to the French cultivator. Their want of fences and hedges must cost the nation annually an immense sum. On the whole, therefore, we must at present beg leave to dissent from the opinion of this ingenious writer in his comparison between French and British culture. This opinion arises from no national prejudices; but if these examples are set forth either for our information or imitation, it is important that we should have a correct view of them.

There is one fact, which is very important in estimating the comparative state of British and French agriculture, and that is, the price of the fee-simple of land and of rents. The taxes are lower in France than in England. Yet it is true, we believe, that while the price of land in England is from 25 to 28 years purchase, or (to explain it to our citizens who are not accustomed to this mode of estimation) while land in England, which rents for £4 sterling, or 17 dollars 76 cents, is worth £100, or $444 44, that of France is not worth more than from 15 to 20 years purchase, or would not sell at the same rent for more than 350 dollars per acre. Besides which, the rents of land in France generally, are from 25 to 50 per cent. lower than those of equal quality in Great Britain.

The section on the theory of vegetation is, though not new, yet an ingenious and lucid display of the doctrines at present received on this subject; and as its tendency will probably be to promote an attention to the nature of our

soils, and to adapt our manures and our cultivation to the character and qualities of our land, we are pleased to see the subject brought forward in a country, in which science has never till lately been brought to lend its aid in the promotion of this art.

The same general remarks may be applied to the section on the analysis of soils. We do not enter into a detailed account of these two sections, because it would lead us into too wide a field for the object we had in view, which was to recommend this work to the attention of our theoretical cultivators.

The next section considers the subject of the instruments of agriculture. After giving a short history of the plough in its various stages of improvement, from the remotest times to the present day, the author makes some very brief description of the various parts of that valuable instrument, and of its most approved construction. He adds a table, by which it would seem, that M. Guillaume's (French) plough when compared to Small's (English) Rotheram plough, as tested by the Dynanometer, was two to one in favour of the French plough. We hope this hint will induce the Agricultural Society of Massachusetts, where means are the most ample of any in the United States, to introduce one of these French ploughs; but we were rather surprised to find no notice whatever of Freeborn's plough, especially in a work written in New York.

So far as our short experience has gone, we were disposed to believe that this plough of New York invention, or at least introduced from that state among us, had properties, which entitled it to a preference over any plough of foreign or domestic fabrication we have yet seen.

We agree with the writer as to the English threshing machine, that it is both too complicated and too expensive for common use; but we think that there have been one or two inventions with us to abridge the labour of threshing, of a simple and cheap construction, which deserve great

encouragement, and which promise to produce an important saving of labour. Mr. Hotchkiss', of Vermont, is among the number—and one invented in Londonderry, in New Hampshire. If the merit of that of Mr. M'Keen, of Poughkeepsie, is any thing like equal to the sanguine description of its inventor, (we mean no disrespect to him in expressing this doubt, but we know that inventors are sometimes deceived) it will probably supersede them all, and we should be happy to hear further respecting it, and to see it in operation. Our premiums on this subject, are still continued; but the instruments heretofore submitted, have been and will be continued to be examined, with a caution and prudence at once liberal and discriminating, as far as our judgment will permit.

The lands of this state are not generally devoted to the smaller grains, and such a machine is of less value to us than it is to the wheat-growing states; but still we should be very desirous of encouraging any labour-saving machine, as it would liberate our farmers from a work which is only a tax on their produce, and by which they would be enabled to devote more time to the essential improvement of their farms.

In the 6th section the author enters upon the subject of Manures. In this he discusses the interesting questions, whether long or short dung, or whether rotted, or dung not rotten, is to be preferred? Whether dung used superficially, or ploughed deep into the soil, is most beneficial? Whether extraneous matters introduced into the dungheap are useful or pernicious? Whether stable manures are best applied directly or indirectly to wheat crops? At what time manures are best applied, and in what quantities?

As to the first question of rotten, or unfermented dung, the writer says, that careful experiments have proved the correctness of theoretical writers. Those parts of the field, to which rotten dung was applied, gave the best crops the *first* year; but those in which long dung, or unfermented

manure was applied, gave the best crops the second and third years. So that he draws the inference, that where we wish to obtain a great crop for one year, rotten dung should be chosen; but where we wish for permanent improvement, we should prefer unfermented manure.

With respect to the question of laying the manure on the surface, or ploughing it in very deep, he is opposed to both methods; to the first, because the rains dissolve and carry away many of its pieces; to the second, because it is laid too deep to undergo the requisite decomposition, to produce which, air and heat and water are indispensible.

He is decidedly in favour of making the compost bed, or manure heap of various materials, both of animal and vegetable origin.

He opposes the direct application of manures to wheat crops, in which we fully concur, not only for the reason assigned by him, that it is apt to produce an abundance of weeds, but because it forces the plants to a preternatural growth; subjects them to the very serious evil of being lodged by rains at the season of maturity; procrastinates that season; and on the whole the crop is more liable to blight, than if such forcing had not been applied.

As to the question of the quantity of manure to be applied, he is not very definite, nor indeed can any general rule be adopted, so much depending on the nature of the soil and its previous state. He remarks justly, that land may have too *much*, as well as too *little* manure. The former tending to produce too much stalk and leaf, and injuring the flavour of the vegetable; and the latter not giving as much force to the plant, nor enriching the soil for future culture, as would be useful and profitable.

Lime, he thinks, should be principally used in composts, and when applied directly to the land should be moderately employed on account of its causticity. He is opposed to the system of paring and burning on dry and gravelly lands, and thinks it is applicable only to marshy, boggy soils, where there is a superabundance of vegetable matter.

He is much disposed to favour the system of ploughing in green crops for manure; and he places buck-wheat at the head of the plants to be used for this purpose. He however quotes the practice of Spain, and (we may add) the Western Islands in favour of the white Lupin. We wish this experiment may be fairly tried in our state, not that we believe that in the vicinity of the great towns where other and richer manure can be obtained in such abundance, the system of ploughing in green crops will ever prevail extensively; but in the interior, where farms are understocked, and where no foreign manure, not produced on the farm, can be procured, we believe this process may be successfully used. If one fair experiment could be made on the white lupin on an extended scale, and it should be found, as in Spain, to be a valuable manure, the seed could be annually imported and might form a valuable article of commerce and agriculture.

In his 7th section, on Tillage, he states that the scientific opinion is in favour of fall ploughing, because to the action of air and moisture it adds the power of frost, whose septic or dividing power is second only to that of the plough; and because one ploughing at this season is equal to two in the spring, when labour is so much more valuable. But in this mode of culture he reminds us that we ought to ridge, as well as plough, so as to carry off the surplus water. Our own experience is strongly in favour of fall ploughing, for both of the reasons assigned; and we are happy to find this practice gaining ground in New England.

He thinks the practice in English husbandry, of frequent ploughings, has been carried too far, though he admits it was the favourite doctrine of the Roman farmers. He seems to sneer at it as the conceit of the Dilettanti, or Gentlemen farmers, and not applicable to profitable culture generally.

We are grieved to see this suggestion, because we believe there is no danger of our erring on this side, and that

much good would be obtained by stimulating our cultivators to a much more liberal use of the plough, than any to which the most industrious of them have been accustomed. After all, they cannot do too much to produce a perfect division of the soil, and they are in no danger of running into ruinous expense on account of any theoretical opinions. They follow the theoretical farmers at an awful distance; and if they could unite their own œconomy and experience to the results of theoretical experiment, they might be gainers; and if they should find they were not so, there is no danger of their continuing to follow unprofitable guides. The evil is, that they are too apt to reject practices, because they are new.

As to the depth of ploughings, he considers it ought to be governed by circumstances; by the character of the soil, whether shallow or deep; and by the plants you propose to raise, whether top-rooted or fibrous. This is in general true; and it is equally true, that the deeper you plough, the greater quantity of manure will be required; but it ought not to be questioned in this age, that deep ploughing, even if it brings up a portion of the subsoil, is permanently beneficial to the land. There is no land which is not benefited by trenching, and no ploughing can equal the effect of the spade in trenching. To be sure, you will require more manure for a year or two, but your land will afterwards repay you ten fold for this first labour. We have tried the experiment on shallow soils, the subsoil sand or gravel. We do not bring the subsoil to the surface, but we loosen it by the plough; and we contend that even the graniferous plants, and especially all the perennial ones, trees in particular, are essentially benefited by deep ploughing.

As to the question, whether level or ridge ploughing is to be preferred, he thinks the former is to be used on light and dry soils, and the latter in clayey or wet ones. We should rather say, that in *all* soils, ridge ploughing is to be

preferred, as exposing the land more perfectly to the action of frost, unless on declivities, where perhaps a light, loose soil, thrown up in ridges, would be exposed to be carried off entirely, or very considerably, by heavy rains.

The writer of the article under review, seems to have reserved all his energy for the section upon the rotation of crops, of which we shall give a more ample account, not only because we concur in his opinions generally, but because we believe it is a subject less understood, seldom judiciously practiced, and more important than any other, to which our attention, in New England, could be directed.

Indeed we know nothing among us, which deserves the name of a succession of crops, except it be the fashion of breaking up our grass lands, when they cease to be productive; and after two or three years culture of potatoes, and Indian corn, laying them down again to grass with barley, rye, or wheat. It may be, that our course of husbandry is the best adapted to our soil and climate; but we are not as yet fully satisfied of this fact, and we should like to see extensive experiments as to the effects of a succession of crops of different plants. The author of this review divides the subject into two distinct heads. The practice of Europe, and the rotation best adapted to our own soil, meridian, and markets. He begins by stating, that it has long since been discovered, that the soil when *left to itself* was never either exhausted, tired, or idle, "but that, however, impoverished by men or animals, it hastens to cover itself with plants of a different, and often opposite character." This fact is notorious and undeniable. This remark, made by observing men, led to the adoption of a succession of crops, conforming as far as their limited means would admit, to the spontaneous productions of nature. "It led, in short, to the system of a succession of crops; and wherever it has been introduced, beneficial effects have followed; and, wherever it has been neglected, agriculture has been either stationary or retrograde." Yet he re-

marks, that in the very face of these obvious truths, farmers continue to resist this cheap and obvious mode of ameliorating their lands.

"On the rotation system, the whole arable part of a farm is divided into four, six, or eight fields, and subjected to a course of crops, denominated according to these respective divisions, into the short, the medium, or the long course. In constructing these courses, attention is paid to the nature of the soil, viz. in soils more wet than dry, more compact than porous, more hard than friable, the course is made up from the following plants—wheat, oats, buck-wheat, the gramineal grasses, beans, vetchlings, clover, cabbages, and chiccory." "In soils of an opposite character (dry, porous or friable), the plants from which to choose are rye, spelts, barley, potatoes, turnips, lupins, Indian corn, clover, sainfoin, and many of the pasture grasses." His general rule is, "*never to select for a crop, plants not adapted to the soil, nor to permit two crops of the same species or kind to follow each other.*"

We would simply remark that we believe this rule rather too rigorous; for, admitting (what is not as yet sufficiently established,) that there is a solid ground for the opinion of modern theorists, that the earth can only furnish a certain quantum of food adapted to a particular plant, though it may abound in other food fitted most perfectly for other plants; yet no experience has yet proved, that the earth will not bear for several years in succession the same plant to advantage, nor that a change before the pabulum of such a plant has been exhausted, would be profitable. We know that the opinion has been entertained, and experience would seem to confirm it, that onions are rather improved in point of quality and productiveness, by being raised many years in succession on the same land; and we are not sure that on an extensive scale, it would not be best for two or three years to raise potatoes, or, in short, any other plants, till we find the crop begins to lessen.

Would not this after all be a wiser rule for general adoption, not to change the plant until it shall appear to deteriorate either as to quantity or quality? We have a full belief in the general doctrine, that there is a necessity of changing the culture and the plants to be raised, but we doubt whether it be necessary or even profitable to subject this rotation to invariable rules.

His second section, on the rotation of crops, is limited to that which is best adapted to our own soil, meridian, and markets.

It should be kept in mind that the pamphlet under review is the production of a *Western New York farmer*, and therefore to be received with some qualification, in Massachusetts.

He commences this part of his subject with the work of Mr. Strickland, a gentleman well-known to many of us; one of the most respectable and impartial English cultivators, who have as yet visited our country. After remarking that New England was not a *corn* country, (by which an Englishman means a *wheat* growing country) and had little to do with *the plough*, and that New York was then, and would continue to be, the granary of America, he proceeds to divert his British readers with sundry details as to our state of culture in 1801, when he was here. Before giving these details, we stop merely to say that though New England is not a wheat growing country, yet he was mistaken in supposing that even at that time we had little to do with the plough. It is to be doubted, whether, even at that period, New England did not keep as many ploughs in action as any part of the United States, in proportion to its extent; and although its staple growth, that of Indian corn might appear to an English farmer who had not visited the continent, as an inferior product, yet Arthur Young and the Baron Humboldt might now tell him, that it is at least to be doubted, whether it is not the most valuable of all the grains raised for the food of man or inferior animals.

We proceed to his details:—"The usual course of crops in New York is, first year, Indian corn; second, rye or wheat; third, flax or oats; and then a repetition of the same as long as the land will bear any thing; after which it is laid by to rest—(we presume he means by this, that is left as fallow.) A Dutchman's course on the Mohawk is, first year, wheat; second and third years, pasture without seed; fourth, oats or flax; and fifth, Indian corn.

He classes New Jersey, Pennsylvania, Delaware and Maryland together, from a resemblance in soil, climate, and culture. There they raise, first year, Indian corn; second, wheat; third and fourth, rubbish pasture, (or we suppose fallow.) Clover is however beginning to be introduced in these states. Two exceptions are however noted by Mr. Strickland. "In the German settlements of Pennsylvania, where, from more attention or skill, the wheat crop averages from eighteen to twenty-five bushels per acre—and the peninsula of Delaware and Maryland, where the rotation of Indian corn, wheat, and rubbish pasture, (or fallow) has reduced the average produce to six bushels per acre; in some instances to two, and *much is so bad* as to be ploughed up again."

We are surprised that Mr. Strickland should not have paid more attention to the culture in New England, where thirty bushels of Indian corn may be fairly assumed as an average crop; and although we have no systematic course of succession, yet we have always avoided the negligent and destructive course of fallows. Suppose the labour applied to be equal on the lands of the middle states and those of Massachusetts, we are persuaded that the actual amount of profit is much superior in New England to that which is obtained in those states, if the facts stated by Mr. Strickland and others, which have been stated to us in regard to these states, may be relied upon. There is one thing which is calculated to deceive both European travellers and our own citizens, who visit the

various parts of the United States. The farms even in the Middle states, are large, in the Southern, very large. The establishments are on a great scale. The culture is very extended for each individual, the whole produce of each cultivator appears enormous to one accustomed to our limited mode of cultivation, but when either expense or product be accurately examined, it will be found that the less fertile lands of the North furnish more food for man and animals, and yield a greater profit than those of much more favoured states. We shall conclude this review in our next number, having devoted as much of the present as was proper, and enough to recommend this work to all our readers.

[To be continued in our next.]

ON THE COMPARATIVE VALUE OF THE OX AND THE HORSE IN AGRICULTURE; AND AN ANSWER TO THE QUESTION, SOMETIMES ASKED, WHY THE MASSACHUSETTS AGRICULTURAL SOCIETY HAVE NEVER OFFERED PREMIUMS FOR THE RAISING OF THE FINEST HORSES?

This subject we propose to discuss, and we are indebted for the greater part of the suggestions, to one of the trustees of this society, who has sent us his reflections on the subject, under the signature of "A Middlesex Farmer." In his opinions, facts, and reasonings we fully agree. This has long been a contested point in Great Britain, and it is well known, that many of the ablest, and most scientific cultivators in that country have contended, that the prevalent practice of the farmers of Great Britain, in preferring the horse to the ox, was injurious, expensive, and the effect of long established prejudices. Perhaps this long perseverance in an unprofitable practice, in a country, in other respects so well instructed in agriculture, as Great Britain, may be accounted for by the great attachment of the opulent gentry to the pleasures of the Chase, and of the Course—

and to the gambling spirit produced by the last. So universal an attachment to this noble animal (so useful wherever despatch is required) has probably led the British farmer to prefer the horse to the ox in agriculture. As much pride has been excited, in having the stoutest horse for the draft, as in having the swiftest horse for the course. It should not moreover be forgotten, that where so many hunters, and coach, and carriage, and other pleasure horses are raised, as are necessary to supply the luxurious people of England, (a country which is literally studded with Gentlemen's seats,) many must be occasionally injured, and would be utterly useless if not condemned to agricultural labour. Still we are sensible that the horses generally employed in agriculture in that country, are not broken down hunters, or coursers, but are expressly raised for the plough and the cart. They are infinitely superior to any American horses for this purpose, having greater weight, more bone and muscle, adapted to slow draft, and almost as patient when obstacles are encountered, as the ox.

Had we this breed, or the Norman horse, it would be more difficult to persuade our farmers that the ox was the preferable animal. Our country horses are strong, tough, capable of enduring hardship, yet sufficiently fleet for other purposes on the road in lighter carriages; in short, they are precisely adapted to our wants—they answer for the plough, the saddle and the chaise.

It ought not to be presumed that for nearly 30 years, the trustees of the Massachusetts Agricultural Society have either been inattentive, or indifferent to this important question in agriculture. It has been often discussed, and the discussion has invariably resulted in the decision, that it is not important to *this state* to encourage the breed of horses. Among other reasons, one alone would be sufficient, which is, that although we can raise them, yet there are neighbouring states which can raise them better, and can furnish us better horses for pleasure, for the carriage and the saddle,

than we can raise ourselves. We are, in short, on the extreme northern verge in which the horse can be raised to any advantage.

The horse raised in the highlands of Scotland, becomes a mere poney—fit only for children, or old decrepit men, used only for the saddle. The noble Norman horse which mounted the Cuirassieurs, or heavy cavalry of Bonaparte, and which as a horse of draft is the most powerful in the world, in the eternal winter of Canada, is only a short, tough, bony, but inferior animal, capable of great endurance, and but little execution.

These are some of the general reasons which probably led our ancestors, and have induced their descendants, simply to raise a race of horses suited to light draft, and at the same time adapted to the saddle, the light cart, or waggon, and the chaise; and for these purposes, it is to be doubted whether a better race can be found than Massachusetts can boast. For the chace, for swift carriages, for excellent coach horses, we must be compelled to travel from Vermont to New-Jersey, or even Virginia.

It is to be doubted whether the Massachusetts Agricultural Society, considering the interests of the state which they are bound to consult, ought to encourage the raising of *pleasure horses*, they are mere articles of luxury. Wealth will always command them in what quarter soever they may be raised, but if the raising them in Massachusetts would not be a profitable occupation, or employment, they ought not to encourage it. If, on the other hand, they had offered a premium for the best draft horses, it would have seemed to decide the question, that the horse was preferable to the ox for agriculture, and this too, at the very moment, when intelligent men in Great Britain began to doubt of their own preference for horses. It was precisely in this state of the controversy, that the general society of this state began to offer premiums, and after much discussion, they thought that they ought not to throw their weight into

the scale in favour of the horse, when such enlightened men as Arthur Young and others, were quoting the example of the New-England states in favour of the use of the ox. The following statement comprises some among many other reasons, for the preference given to the ox over the horse in agriculture.

1. A young horse of 5 years old commonly costs (if a good animal) as much as a pair of young oxen or steers, and no one will pretend that he will do as much work, or (while young) half as much.

2. The horse will consume more than half as much as the two steers; or in other words, to keep a good horse in equally good working order, he will consume more than a steer or ox of his own age.

3. The horse is more delicate in his food. He cannot retain his flesh or strength on food, on which an ox will continue to work well and long.

4. The money you pay for a young ox is like money at interest, the longer he lives, the more he grows, and he becomes more valuable. Indeed he increases in value almost at compound interest. The exact reverse is the case with the horse. He attains his maximum of value at 7 or 8 years, and every year afterwards diminishes his value. His bulk is of no use to you because his carcase is worthless.

5. An ox, owing to the thickness and toughness of his skin, and to the length and closeness of his hair, or in other words, owing to his being probably a native of a colder climate, or being originally designed for a greater variety of climates, can endure our cold and stormy weather much better than the horse. The horse is an exotick of a warmer region, a transplanted plant, capable indeed of living and thriving, but often suffering under the severities of our seasons. The ox seems calculated for all climates. In England and the southern states, the horse may indeed endure, and even improve in vigour, but in Massachusetts he will

deteriorate, unless treated with more tenderness than farmers usually feel or employ towards their animals.

6. But the most important reason of all is, that the horse though subject to more diseases, and infinitely more tender than the ox, becomes utterly useless when he is so lame as to be incapable of work, or so old as to be of little use in labour, while the ox is often from such accidents more valuable. He has a fine appetite, soon fattens, with much more readiness than the horse, and his carcase sells for as much, or more money, than the animal would have brought in his best state.

7. Compare the harness of the ox with that of the horse, and it will be perceived that the difference is very great in favour of the former. The ox requires only a yoke which with its apparatus may cost about 3 dollars. It rarely needs repair, and when repaired, it costs little. But the harness of the horse, owing to the tenderness of his skin, and his more violent motions, must be of leather. Its first cost is much greater, we may say four times as great. It wears out sooner, and costs much more to keep it in repair while it is capable of being repaired. To this item, may be added the expense of shoes, the horse wearing his out much faster, and requiring them on all his feet the year round, while the ox needs shoes only on his fore feet during summer.

8. We will now compare the animals dead, whether occasioned by accident, or design. We cannot at present recollect any use to which any part of a dead horse in this country can be applied, except his hide, which is used for a few very limited purposes.

In England indeed his flesh sells for something for the food of hounds, and we are thankful that we have no such use for them here. We have no game laws, and but little game, and we are not therefore obliged to encounter such an useless expense, as supporting a pack of hounds on any of our estates.

The ox furnishes probably more, and a greater number of valuable articles for the supply, not of the luxuries, but the wants of mankind, than any animal in existence. His hair is necessary, and indispensibly so, to the mason in the composition of his mortar for ceilings. His hide is equally necessary for our shoes and boots, without which we could not be kept dry or well shod; and for many other purposes in manufactures. His flesh not only furnishes us with the most wholesome and best food we enjoy, but it is an article not to be dispensed with in commerce in the form of salted beef. His tallow furnishes our candles, and hard and soft soap. His hoofs afford glue. Even the tips of his horns are converted into the handles of knives, and the entire horn is also applied to some uses. When we shall have become greater economists in agriculture, the bones of this noble animal will be broken in mills and as in England, restored again to the soil where they will make an ample return as manure, for what the animal may have taken from it during his life.

With some general reflections we shall close this article. We are aware, that in England a preference is given to horses; so it is generally on the continent of Europe. Exceptions and important exceptions there are however, to this practice, and the earliest cultivators of which classick writers speak, always considered the ox the proper animal for the plough. The Jewish, Greek, and Roman farmers certainly thought the ox the preferable animal for the cultivation of land. In our own country, the Dutch, and German farmers have a preference for horses. It is indeed surprising that the English farmer can afford to raise the ox solely for the table, and keep him idle till the butcher selects him for his victim. If it were a fact that his flesh was invariably finer, luxury, and epicureans might find an apology for it, though the farmer could then hardly find an excuse for such a sacrifice, but the fact is not so. The beef of Great Britain is not finer, fatter, more tender, more juicy, better flavoured

than that of this country generally. Their oxen are not so large as ours on the whole, though it must be admitted the breed is more beautiful, better formed, and more profitable, having more flesh and less offal, but in this respect we shall soon be their rivals.

It is difficult to say why this preference has so long existed in Great Britain. It may be because the horse is so much more easily raised in their mild and equal climate; or because they have no extensive woods and rough pastures as we have in which our young horned cattle range at pleasure, in which they live by browsing in places, where the horse would starve; or because their lands are more free from rocks and stumps, and therefore they do not need so patient an animal as the ox; but we are inclined above all to account for it by the great predilection of that whole nation for the horse, as the animal whose feats they witness on the race course, whose courage, docility, and strength they experience in war, whose vigour and activity they enjoy in the chase, whose beauty and fleetness they daily witness in the saddle, the gig, and the coach. It is certain that independent of agriculture there is greater use made of the horse in England, than in any country in the world. It is an Englishman's pride and pleasure to be well mounted. They almost realize the fable of the Centaurs. They are almost united to their horses.

That the same taste should descend to the lower orders, and that the renters of farms, and the peasants who work them should be so attached to them as to be unwilling to give them up for the slow and patient and useful ox, is not surprising; but for us, let us adhere to the usage of our ancestors.

NOTICE OF A LATE WORK, ENTITLED, "THE SCIENCE OF HORTICULTURE, INCLUDING A PRACTICAL SYSTEM FOR THE MANAGEMENT OF FRUIT TREES, ARRANGED ON DEMONSTRATIVE PHYSIOLOGICAL PRINCIPLES, ILLUSTRATED BY SKETCHES IN TWELVE PLATES, WITH A COMMENTARY ON THE WORKS OF BRADLEE, HITT, MILLER FORSYTH, KNIGHT, KERWAN, SIR HUMPHREY DAVY, AND MRS. IBBOTSON." BY JOSEPH HAYWARD, GENT. London, 1818.

This title is to be sure an imposing one, and has the air of some degree of self-assurance; nor will this impression be lessened by the perusal of the work itself. Mr. Hayward certainly has as little respect for the opinions of those who have gone before him in the science of horticulture, as could be wished. He treats all his rivals in the character of an arbiter—condemns one, and praises some thoughts and suggestions of another, taking care, however, that none should have any right on the whole, to pride themselves on what they had done or written. Generally speaking, this arrogant spirit is most discovered by those who have the least pretensions—but it is not precisely so with Mr. Hayward. His work certainly has considerable merit. It has the merit of great perspicuity—energy—orderly arrangement, and some novelty. His high tone rather seems to proceed from a bold and fearless disregard of names and authority, rather than vanity, or contempt for others. It seems to arise from a habit of saying and writing boldly, and frankly, what the author thought, whether the effect should be to depreciate the established reputation, or adopted, and received opinions of others or not.

The book is dedicated to the president and members of the Horticultural Society of London, a body justly entitled to the highest respect, both for the respectability of its members—its objects, and the many curious, learned, and useful articles which it has given to the world.

It would appear by this dedication, that Mr. Hayward has received the most ample testimonies of the respect

and confidence of this learned society.—"Possibly it may appear to some," says he, "that from the very flattering attention which your society have been pleased to bestow on such papers as I have occasionally taken the liberty of submitting to your inspection at various times during the past eight or ten years—your offer of publishing them among your transactions—and your professed desire of making extracts for your publick readings, ought not to have been resisted."

The reason he assigns for not having complied with this very flattering solicitation, is, that by so doing, the author, by the rules of the society, loses all further exclusive right to his papers, so submitted.

This, then, in addition to the opinion we had otherwise formed of its merits, has induced us to bring this book before the Agricultural and Horticultural community in this State.

We shall not adopt the modern, and in many cases the absurd practice of reviewers, to put a title page at the head of, and merely as an apology for an essay, in which all the learning of the author is pompously displayed, but in which we hear nothing of the work under review.—Such a practice is very well where the work pretended to be reviewed is of no value—but it is very tantalizing when the topick is very interesting, and the author, whose work ought to be the subject of the review, is either celebrated —or we think he has had better opportunities than the reviewer, of becoming acquainted with it. In such cases, we prefer to see something of the writer himself, and to hear him speak in his own behalf.

It is peculiarly necessary in this case, because we are as yet infants in Horticultural science.—We have not yet brought into use, all the common culinary vegetables—we cultivate none of them with a skill to be compared with that of the Dutch and English gardeners. In fruits, and their cultivation—in the management of trees and grapes,

we are half a century behind them.—We ought, therefore, to bring ourselves acquainted with the progress of the science, (for it is truly a science in Europe,) and we can only do that by reading the works of their writers. To enable our readers to judge, whether Mr. Hayward's work ought to make a part of their libraries, or at least, of their reading—and also to give those who may never have the opportunity of seeing it, some idea of its merit—and to enable them to derive some advantage from the talents of the author, we shall give a full account of the work, and make, with regard to several of his topicks, very copious extracts, which was the old fashioned, and very good fashioned mode of reviewing new works of merit.

After some general introductory observations and comments, Mr. Hayward proceeds to discuss the following subjects, in the order below stated.—The nature and habits of the roots of trees—On the food of plants—Chemical principles, applied to plants, and practical deductions from them—Observations and comments on the composition of soils, and the agency of earths in vegetation—On the sap of trees, its rise, and circulation—On the office and use of the leaves of plants—On the art of pruning—Methods of Hitt, Forsyth and Knight, considered—Deduction, explanation, and application of the laws of nature, for the government of fruit trees—Comments on the general mode of management of fruit trees, by nurserymen—Instructions for the management of trees in a nursery—Observations on soils, and the preparation of beds and borders for fruit trees.—[We shall omit any notice of his ample directions for the training of wall and espalier fruit trees, as not generally applicable here, and those who have expensive wall fruit, can well afford to get the book.] On the management of *old* standard fruit trees—currants and gooseberries—On blight and diseases of trees, and remarks on Forsyth's and Knight's plans for their restoration.

It will be perceived that the topicks are well chosen, important, and judiciously arranged. It will be now seen in what manner he has treated them.

OF THE ROOTS OF PLANTS.

After speaking of the manner in which roots force themselves into the ground, their relative importance, that they form and determine the growth of the plant or tree, and its constitution, our author proceeds,

"From hence it must be concluded, that in planting trees, two essential objects present themselves for consideration. First, to ascertain the soil best adapted to afford a sufficient and accommodating body, bed, or space for the roots to repose and range in freely, and to produce and support such habits as are most desired—and next, that the soil contains, or will admit the application of a supply of food, of a proper quality, and in due quantity. And to determine this, due attention must also be paid to the situation and elevation of the roots in relation to the surface of the soil. In a deep, tenacious soil, or clay, roots can only find a free passage in clefts and fissures which are formed by its contraction; and as these openings are not close together, or numerous, the roots do not divide much, or become fibrous; but those which strike into the fissures, range wide and deep, and getting below the influence of the air, and sun, collect their food from a source ill adapted to fructification; and accordingly such trees are generally found to be of a cold, aqueous, and unprolific nature."

"On the contrary, when the soil is light, porous, and shallow, the roots meeting no obstruction, divide and form a great number of fibrils, which, ranging horizontally, and more exposed to the effect of the sun, and air, incline a tree more to become fruitful than to an increase of wood, and an extension of branches; and in such a situation, the

greatest supply of food being appropriated to the production of fruit, the tree grows but little in size."

He then quotes the opinions of the celebrated Hitt, Knight and Miller, in support of the same sentiments, and in favour of shallow planting. We shall not insert these "quotations," because those books are to be found in every large library. We cannot resist, however, giving a short paragraph from the truly respectable Philip Miller, one of the best practical cultivators that ever lived. "Some authors (says Miller) who treat of the qualities of the earth, say it ought to be of the same quality, three or four feet down, for trees, which, (if they have not that depth,) will languish and decay after they have been planted six years. But this is not true in fact: for most trees will thrive very well, if they have two feet depth of good earth, especially fruit trees; which produce the most generous fruits, when their roots spread near the surface of the earth." We were tempted to cite this passage, not only from Mr. Miller's high character and deserved weight, but because we are persuaded, that the prevailing error with us is to plant too deeply; and we think that we remedy the evil by filling up the whole deep cavity with good soil. Such a hole is a perfect prison to the young tree, from which it can never, or with difficulty, escape. We have scarcely a tree on our own place which was not planted too deep—more recent experience has convinced us of this fact.

He then proceeds to state a theory of Mrs. Ibbotson, in opposition to these sound and practical remarks, and proceeds to refute it, as we think, successfully. To those who have not heard of this extraordinary lady, who has pushed her inquiries to a great length into the physiology, or structure, and economy of plants, it may be proper to state, that she has acquired very considerable reputation, and attracted much attention, by her investigation of the internal structure of plants, which she affected by the aid of a powerful solar microscope; but Mr. Hayward thinks

that in applying the results of her discoveries, and her theory to practice, she has made very great mistakes—a case very far from being uncommon.

Mrs. Ibbotson advanced the opinion "that it was the tap root which always forms the leading shoot of the tree, and if it is cut, it will, without doubt, spoil that part, by forming two middle stems to the tree; and as the beauty of the tree depends much on the perpendicular height of its single pillar, the custom they have in most nurseries, of curtailing the tap root, is a most vicious one." She adds, "What is the use of the tap root? By shooting down perpendicularly to fix the tree firmly to the ground, and keep it straight in that position." This, as Mr. Hayward very justly remarks is neither supported by the observation of nature, nor by the principles of science.—[Indeed it may be considered as a direct attack on one of the most fundamental and well settled principles both of planting trees, and of transplanting all smaller plants—directly opposed to every day's sober experience, and therefore of pernicious tendency. The whole practice of *transplantation*, with a view to ameliorating, would be destroyed by it, if the principle were adopted. From the cabbage to the oak, the regular, well-informed nurserymen have been in the practice of shortening the tap root, or almost removing it, with a view of forcing the plant or tree to throw out smaller fibrous roots, nearer the surface. On this principle, trees the most impatient of removal, the most difficult to transplant, may be removed almost as often as you please, and almost without the appearance of suffering by the change. This opinion of Mrs. Ibbotson strikes at the root of all past experience; and we may venture to say, if adopted, would prevent the successful transplantation of many trees, which are now safely and easily removed. Thus the walnut of every kind, and the cherry, are difficult to remove, if you suffer them to stand till they have sent a deep tap root into the earth; but if removed early into a new nursery, they

are as easily managed as any other trees; because they will furnish such an abundance of small fibrous roots, as will insure their success on a second, or a third judicious removal. In short it may be affirmed as a general proposition, from our own experience, that the greater the number of small fibrous superficial roots—the more easy and safe will be the transplantation—the more readily will the transplanted root or plant become naturalized in its new situation—the less will it feel the effects of the removal, and the more rapid and secure will be its future growth.

The analogy, from the cultivation of plants in pots or boxes, according to the practice in green and hot houses, will satisfy any observing man. The roots of these plants are wholly fibrous. They are shifted or changed once or twice a year. They may be removed from one tub or pot to another, in summer or winter, or from a pot to a border, without experiencing the smallest injury, or scarcely a check. In great transplantations, or the transplanting of larger trees, the same principle should be applied. And where you have not a sufficient number of superficial fibrous roots, you should cut off not only the tap root, but such a proportion of the large lateral and horizontal roots as to oblige or force the plant to send out the competent number of small fibrous ones.]—EDITORS.

"What person," says Mr Hayward, "possessing the smallest knowledge of *mechanics*, could ever expect that a pole, with any substance fixed at its top, exposing a great surface to the winds, could remain straight in its perpendicular position, when set in the earth, without horizontal fixtures?" [or, as he might have said, braces?] "Indeed, the elm," he remarks, "is seldom if ever found with a tap root, but is supported in its perpendicular position wholly by horizontal or lateral roots." [If he had known the noble drooping elm of America, which will not thrive in England, he might have said, that this noble and most beautiful forest tree seldom sends its roots one foot below

the surface, and not unfrequently merely skims the surface, just below the grass sward. Yet who ever knew an elm overthrown? It survives, unhurt, all our furious tornadoes.]—EDITORS.

[Mrs. Ibbotson proceeds in her theory, to suppose that trees require some sorts of food or nutriment, which the surface does not afford—that probably *minerals* are wanted to form the juices of the bark—that therefore the descent of the tap root is necessary to the health and vigour of the tree. She asserts that the loss of the tap root can never be remedied; and of course it follows, that no transplanted tree can ever be equal to one suffered to stand where it was planted: an assertion contradicted by the experience of 2000 years. She also recommends throwing a great quantity of water into the hole, into which a tree is transplanted, or in the language of gardeners, "puddling it," and also a large barrow of good mould. Now it is well ascertained that the practice of profusely watering plants on their removal, is rather hurtful than beneficial; a fine division of the soil, and treading it firmly round the transplanted plant, being much preferred.]—EDITORS.

Mr. Hayward with a great fund of good sense, replies to these remarks: "That a *tap* root or *any other* root is peculiarly adapted to supply any particular branch of a tree, (such as Mrs. Ibbotson had stated its effect to be on the leading shoot,) I very much doubt—but at any rate it is not an invariable law. Whenever any particular root is taken off, it does not alter or affect any *particular* branch, but the whole of the branches are equally affected by the privation or loss." "A great quantity of water poured into the pit, on transplanting a tree, will often *cement* or *encrust* the earth, and render it so close and adhesive, that it will obstruct the emission of fresh radicals, or the progress of old ones, and the plant will be in consequence much injured." [Here again we must recur to the analogy of the cultivation of smaller green-house plants, because if a

thorough drenching of water, on their removal, as is well known, either destroys them, or checks their growth, by preventing the free passage of small fibrous roots, we cannot perceive why the same effect should not follow in the coarser and less scientifick and artificial cultivation of trees. It is an undoubted fact, that gardeners employed in cultivating tender plants, make the earth as fine as possible, throw it on lightly, water with great care and moderation, and if they deluge the plant with water, (though in a pot or tub, it has the advantage of much easier access of sun and air,) it will grow sickly and perish, owing to the difficulty of pushing its tender fibrous roots through the encrusted solid earth, forcibly compressed by the water. We do not see why the analogy does not hold, and our experience, and very successful experience, in the transplantation of trees, fully supports the inference which reason and analogy would make from the above data.]—EDITORS.

"Water," says Mr. Hayward, "should be applied little and often. This will afford sufficient moisture, and keep the soil loose."

"Mould may be a good thing thrown into the pit at the time of digging, in the quantity mentioned by Mrs. Ibbotson [a wheelbarrow for each tree] for forest trees, but it must be improper for fruit trees, for by retaining a large portion of moisture, it will oppose fructification, and endanger their health, or by affording a luxuriant supply of food, the roots may be made to increase in size, but form few in number. A few large roots, spreading wide, and running deep, may be of importance in producing large timber trees, but it would be prejudicial to a fruit tree, for as before observed, those trees are *always* more prolific when kept near the surface of the soil, and when they are much divided, or fibrous."

This first article is a good specimen of the work, and proves, that the author unites practical knowledge to science.

His next subject is

THE FOOD OF PLANTS.

This is more exclusively scientific, and it must be acknowledged, that this department of natural history is less understood, and probably will continue for many years, perhaps forever, to be more imperfectly treated than any other. Sir Humphrey Davy's work was among the first attempts to apply the improvements in chemical knowledge to the cultivation of plants. Kirwan had entered the career before him, but much remains to be done. Mr. Hayward, in this chapter, does little more than to quote from preceding writers, the opinions and theories often fanciful, and in all cases loose, and not subject to rigorous demonstration.

That some, and very great aid, will finally be derived from the application of chemistry to agriculture, may reasonably be hoped. Its success, when applied to the mechanick arts, gives us reasonable ground to entertain this expectation.

We shall merely give a short synopsis of this chapter, in which so little is original.

"Vegetables, like animals," says Mr. Hayward, "vary n their nature and habits, and like them, have their peculiar food, for although the food of plants may generally be composed of the same materials or elements, it varies in the proportion of its composition, and thereby becomes adapted to different purposes. Thus we find a soil which will furnish only food enough to support one vegetable of a peculiar kind, will at the same time furnish sufficient to sustain many others of different species."

[This general proposition is unquestionably true, and it is almost the only one we know of, that has been reduced to certainty. That some plants will thrive only in a particular soil—that they will perish when removed from it—that

plants will grow for a given time on a soil, and will then cease to be supported by it, though other plants will flourish abundantly in the same spot, which refuses sustenance to the others, are facts settled beyond doubt. It would therefore seem that we have to seek a little farther than into the *general* question, what is the *food of plants?* because each plant may require a different species of food; and the inquiry ought rather to be, what is the particular species of food required by any given plant? There however have been incessant attempts for two thousand years to settle the question, in what does the food of plants consist; sometimes it has been supposed to be water only—at other times salts—at others carbonaceous matter—and the strange anomaly of the operation of the plaster of Paris, or gypsum, has put all philosophy at fault. No man has been able to account for its undoubted effects, unless the theory of Sir H. Davy, the most plausible, be admitted, that gypsum is a constituent part of all plants which appear to be benefitted by its application, and therefore it operates directly as a *pabulum* for such plants as require it, for their perfection, and developement, and in such soils *only* where there is a defect, either entire, or partial of this substance. This theory must stand till we have a better—and if it be the true one, it overthrows all the former doctrines on this subject, for it shews that some of the earths, and perhaps all of them must enter into the food of plants, in addition to the saline substances, gases and water. *How* they so enter, is as yet unknown—whether they are so minutely dissolved as to enter the plant in a state of solution, or whether the vessels of the plant are capable of taking up a portion of the earth itself, does not seem to be satisfactorily settled.]—EDITORS.

We shall merely give a short sketch of the various opinions of the writers on the subject of the food of plants, as cited by Mr. Hayward.

Bradlee, an early English writer on agriculture, and the physiology of plants, compares *trees and vegetables generally*, to *animals*, and as some of the latter live only on land, and others in the water, some in fresh, and others in salt water, and as the same is found to be the case with vegetables, he infers, (and we think unanswerably,) that they each require a different species of food peculiar to themselves, (and therefore all attempts to find out certain common elements for all of them, will be vain.—The only study should be to find out the species of food adapted to each valuable plant.

Bradlee, Hitt and Miller, considered salts of various kinds, to be the specific food of plants, which every species of earth contains within itself. This to be sure was loose enough, and was only an easy way, often adopted by theorists of explaining a thing which they did not understand. To this doctrine Mr. Hayward objects, and very justly, because the fact had not been as it ought to be sufficiently ascertained. He made many experiments with sea salt, nitre, soda, barilla, &c., and he concluded that salts were not in *any* degree essential to the food of plants. [But we are not satisfied with his conclusion—he has stated it too broadly, though they may not be essential. We know that all these substances are in certain proportions extremely, nay, *vastly* promotive of vegetation. They will often produce greater effects than rotten dung of animals, which is supposed to contain a great quantity of carbonaceous matter. To some plants they are almost a specific remedy for disease, and a stimulus. Thus to the asparagus, (a plant produced on the sea shore,) common salt, (muriate of soda,) is a very excellent application.]—EDITORS.

Kirwan and Sir Humphrey Davy appear to have made some nearer approaches to the probable truth, in relation to this hidden part of the processes of nature. Mr. Kirwan observes that "the first requisite to a fertile soil is, that it

contain sufficient of the three or four simple earths, and of the soluble carbonaceous principle: the other requisites are, that the proportion of each, and general texture of the soil be such as to admit, and to retain as much water as is necessary to vegetation, and no more."

In other words, *that* soil, which is most capable of retaining a moderate degree of moisture, without holding it in too great abundance, is the best. Garden mould possesses this property in the highest possible degree. It suffers the water to pass through it freely, and yet retains a portion of it in great droughts, much longer than any other earth.

"Soils," says Sir Humphrey Davy, "in all cases consist of a mixture of differently divided earthy matter, and with animal or vegetable substances, in a state of decomposition, and certain saline ingredients. The earthy matters are the true basis of the soil. The other parts, whether natural, or artificially introduced, operate in the same manner."

Kirwan observes, "that the only substances common to growing vegetables, and the soils in which they grow, are water, coal, different earths, and salts. These, therefore, are the true food of vegetables."

Sir H. Davy adds, "that vegetable and animal substances, deposited in the soil, as shewn by universal experience, are *consumed* during the process of vegetation, and they can only nourish the plant by affording solid matter, capable of being dissolved by the fluids in the leaves of vegetables."

"The great object in the application of manures, should be to make them afford as much soluble matter as possible to the roots of the plant, and *that* in a slow and gradual manner, so that it may be entirely consumed in forming its sap and organized parts." [These doctrines, we have no doubt, are true: but they are generalizations, and have received from their authors no specific application.]

Hazenfratz and Mr. Davy, both concur in the opinion, that coal and carbonaceous matter, make an important ingredient in plants. And Sir H. Davy says, that no substance is more necessary to plants than carbonaceous matter. That this exists in a very considerable proportion, in most fermented vegetable substances, there is no doubt: but we do not perceive that Mr. Hayward, or Sir Humphrey Davy, or Mr. Kirwan, have as yet made many steps towards the increase or improvement of our manures, though they have, particularly Mr. Davy, led us to the consideration of our soils, and to the means of supplying their defects.

On the whole, we must consider this chapter "on the food of plants," as having added very little to our stock, we will not say of knowledge, (for as yet there is little which has been written upon it, that deserves the name of knowledge,) but to our *theoretical notions* on this subject.

We shall pass over his next chapter "on chemical principles and practical deductions," because we perceive in it only a feeble and imperfect repetition of certain trite chemical principles, and no practical deductions from them whatever. It is mere parade.

His next chapter is on the important subject of the composition of soils, and their agency in vegetation. The first part of it is taken up in a loose and very trite disquisition upon the nature of soils, in which there is a mixture of chemical principles, and bold assumption, furnishing, so far as we can perceive, little valuable information, applicable to practical agriculture. He concludes it with certain aphorisms, or propositions, which, though they may, or may not be true, afford little aid to the practical farmer.

The soundest opinions are, that the most fertile soils are those which are so compounded as to admit of the greatest, most minute, and perfect division, expansion and dissemination of water through them, and which contain a sufficient proportion of the carbonaceous principle of calcareous

earth, to correct acidity and putrefaction. Perhaps this part of our review will not produce an opinion favourable to the author; but the part which we shall notice in our next number will shew his practical skill.

Southbridge, 20th May, 1820.

To T. L. WINTHROP, ESQ.

SIR,

I wish you to give the following hint to wool-growers in your quarterly reports. Many of the wool-growers are in the habit of folding up their fleeces with the flesh side inwards, which makes it often very difficult to open the fleece; and at the same time the small fribs, or little short pieces of clippings, adhere to it so fast that it is difficult even to pick them off, as very few will shake off. This is very detrimental to the spinning as it occasions the yarn to break, as the small fribs work into a knob. I am astonished that they should persist in winding the fleece up in that manner, as it collects all the dust; and it is a great disadvantage to the seller; as the wool shews to a great disadvantage, and looks so much coarser than when the inside of the fleece is outwards, I should not have supposed this hint had been required; but I find so many lots of wool done up in the manner described, that you will oblige the manufacturers by inserting this hint in your reports. It is so difficult at times to open the fleeces, that a person cannot do so much work by one third, and even half. In one instance, I recollect I was not able to sort more than from twelve to fourteen fleeces in the course of the day.

Your humble servant,

WILLIAM BARKER.

END OF NO. II. VOL. VI.

COURT-STREET, BOSTON,
MAY, 1820.

WELLS & LILLY,

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